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Whiting-Plover Complete Mill Alterations

Substantial Increase of Working Space Provided For New Finishing Department of Whiting-Plover Paper Co. At Stevens Point—Water Control Benefits To Paper Mills Discussed—Kimberly-Clark Wins Safety Contest.

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., October 9, 1939—Whiting-Plover Paper Company, Stevens Point, Wis., has completed mill alterations for a new finishing department which will give thousands of square feet of additional working space.

A former drying loft, used only for storage since an air drying system was installed in another part of the mill in 1935, has been converted into the new department. It provides for a large workroom 174 by 67 feet in size, and a smaller room adjoining. Reinforced steel girders were installed under the floor, and a new entrance and stairway have been built. New hardwood flooring has been laid. Structural glass brick has been built into the walls to admit even light, and a new lighting system has been installed, using daylight globes. Most of the interior has been painted white, and an air-conditioning system has been installed for both temperature and humidity control. A large freight elevator has been added to bring the manufactured stock to the finishing room.

New Cutting Equipment Installed

The company also has installed new cutting equipment so as to slit and cut the paper in a continuous process, before delivery to the finishing room.

Work on the alterations was started last May by C. R. Meyer Construction Company, Oshkosh, Wis., and the remodeling was carried on without interrupting mill operations.

Prior to occupancy of the new quarters, the company held open house for the employees and their families, with 600 to 700 attending. An orchestra was engaged for dancing in the new rooms, and refreshments were served. Numerous prizes were distributed to those attending. The celebration was conducted by various mill committees in cooperation with the management.

Water Control Benefits to Paper Mills Discussed

Water control benefits to paper mills of the Fox River Valley were described to the Lions Club of Menasha, Wis., by E. G. Sonnenberg of Menasha, one of the advocates of the project, in an address last week.

Mr. Sonnenberg explained the plans for construction of a vast storage reservoir on the Wolf River at Lily, Wis. He said work would be started immediately so flood waters could be impounded next spring. The water will be released in July when summer drought sets in, and the flow will not only be more uniform for power purposes, but the algae growth is expected to be carried away so mills will not be forced to close on account of the water condition.

The dam to be constructed at Lily, Mr. Sonnenberg said, will create a lake five miles long and three miles wide. All of the land to be flooded is either swamp or cutover area, with only two small cultivated farms within the region. Two billion gallons of water will be retained.

Construction and maintenance of the dam will be financed by paper mills, and each will be charged tolls according to its capacity as the water is released. The dam will be operated under state supervision. This improvement is the result of a long fight in the Wisconsin Legislature to obtain the necessary charter. The bill has now been signed by Gov. Julius P. Heil, and the operating company known as the Wolf River Reservoir Company is now ready to proceed with construction.

Kimberly-Clark Wins Safety Contest

The Atlas mill of the Kimberly-Clark Corporation at Appleton, Wis., has been declared the winner of the company's inter-mill safety contest which was in progress from April 16 to September 17. During that period, the mill operated without a lost-time injury, with 104,762 man-hours worked. The Niagara, Wis., mill was second, the Kimberly, Wis., mill third, Lakeview mill, Neenah, Wis., fourth, and Niagara Falls, N. Y., fifth.

As a reward for its safety record, Atlas mill will send three representatives to the National Safety Congress at Atlantic City, N. J., October 16 to 20, the mill manager, one salaried employee and one hourly paid employee, with expenses paid. The Niagara mill will send one salaried and one hourly paid employee.

To Hear Further Freight Rate Testimony

Further testimony on freight rates charged for the transportation of pulp wood was to be taken by the

(Continued on page 29)

Detailed Reorganization Plan for Abitibi

Bradshaw-Ferguson-Scott Committee Sponsors New Plan In Protracted Reorganization of Abitibi Power & Paper Co.—Five Financial Provisions Outlined For Security Holders and Creditors — Other Industrial News.

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., October 9, 1939—Detailed plan of reorganization of Abitibi Power and Paper Company, sponsored by the Bradshaw-Ferguson-Scott committee, has now been in the hands of all interested committees for several days. Replies supporting the plan as now outlined have been received from chairmen of all committees except the bondholders' protective committee of which H. J. Symington, K. C., Montreal, is chairman.

Although no official word has been received from the Symington committee, it is thought they will find little to favor in the latest proposals. It is suggested that to give bond holders any chance of getting their investment back would need a period of unparalleled profits. There is quite a possibility that no action will be taken and Abitibi will continue for a further period in receivership.

New Plan Has Five Provisions

The plan as revealed by Mr. Bradshaw is briefly as follows:

(1.) For each $1,000 bond, plus accrued and unpaid interest, the holder would get 40 shares of $25 par value, cumulative, convertible preferred stock. The new preferred would carry a cumulative dividend of $1.85 a share and would be redeemable at $37 a share. Each new preferred share would be convertible into common at the rate of two common shares for each preferred share. Preferred shareholders, who would be the present bondholders, would have the right to elect a majority of the directors of the company.

(2.) For each existing share of 7% preferred the holder would get 12 new common shares.

(3.) For each existing 6% preferred share, the holder would get four new common shares.

(4.) Each existing common share would be converted into 1/10 share of new common.

(5.) Unsecured creditors would accept some reduction in their claims and the balance, probably 75% of the face amount, would be paid in cash over a three-year period.

No Additional Working Capital Needed

No provision has been made for raising any working capital for Abitibi under the plan. Spokesmen for interests that have studied the plan point out that Abitibi's needs for additional working capital by the end of this year will have been so greatly reduced that little more money, if any, will be required. At the end of 1938, Abitibi reported net working capital of 7.3 millions of dollars. Current assets of 5.4 millions of dollars included four millions of receiver's certificates which are scheduled to be practically paid off from earnings by the end of 1939.

Payment of creditors' claims in cash over a three-year period would not require more than $200,000 or $300,000 per year, assuming that these claims are for the $750,000 shown on the last balance sheet.

Estimates of Abitibi's new capital requirements have been coming down ever since the first figures were published in 1937. The first bondholders' protective committee plan—the Ripley plan—at first provided for raising 14 million dollars of new money. This was later revised down by an amount equal to the consolidated net earnings of the company from June 30, 1937, to the date the plan might become effective. By the time that the bondholders presented their proposals for judicial sale last March, their ideas of new capital required for working capital purposes were down to 2 million dollars.

Now it is estimated that Abitibi's working capital by the end of 1939 may be as high as 10 million dollars which is thought by equity interests to be adequate for needs. Any temporary accommodation might be arranged through bank loans.

Assuming that this latest plan were to be carried out, bondholders would receive annual income of $74 on the 40 shares of new preferred they would get for each $1,000 bond. This would be approximately equivalent to a 5% return on the original principal, plus interest on unpaid interest.

Great Lake to Handle Newsprint Contract

Great Lakes Paper Company, Limited, Fort William, Ont., of which Hon. Earl Rowe is president, will have its own plant supply newsprint under the contract with the Milwaukee Journal, obtained by the company when the former contract with the Abitibi Power and Paper Company, Limited, expired in 1938. The contract originally estimated to require around 20,000 tons of newsprint for this year, but now understood to be requiring closer to 30,000 tons, was reallocated by the Great Lakes Company as a part of its program of assistant in levelling out production schedules throughout the Canadian newsprint industry. Great Lakes Paper Company is continuing to make some concessions to assist in giving regular operations to less well placed newsprint mills. In spite of this, the company has been able to fulfill most of its contracts. At present the Great Lakes Company is experiencing a considerable step-up in demand. It is thought that, providing present prospects for better scale operations next year are realized, pro-rating will not be such an issue in the industry as it has been this year. Operations of Great Lakes Paper Company for the year until recently have averaged around sixty-five per cent of capacity but improvement is now looked for. There has been no consideration given to the question of paying a dividend on the company's preferred stocks as yet nor is it likely the question will come up in the near future, it is stated. No dividends have been paid on either the classes A or B preference since issued in 1936. Arrears amounted to $8 a share on each class of stock on October 1st, 1939.

Hinde & Dauch Cites Trouble in Europe

L. F. Winchell, vice president and general manager of the Hinde & Dauch Paper Company of Canada,

Toronto, has sent a letter to the shareholders of the company in which he says that hostilities in Europe have brought demands and a situation upon the company so presently abnormal as to be exceedingly trying and confusing. He adds, "likewise it has imposed upon us added responsibilities to Canada and the Empire no less than to you as shareholders. We have a full realization of these responsibilities and will be constantly alert toward keeping pace with them."

To Remove Pulpwod Waste From River

It is understood that within the next few days the recently formed Pulp Recovery, Limited, will begin at Hawkesbury, Ontario, removing waste pulpwood from the Ottawa river, for the manufacture of heavy paper boxes and other products. About fifty persons will be employed at the start. The area in which work will commence is in the Snye Channel where it is estimated there are over 100,000 tons of the material.

Box Association Holds Golf Tournament

The annual fall golf tournament of the Canadian Paper Box Manufacturers' Association was held recently at Kitchener when seventy-four active and supply members of the organization were in attendance. At the dinner William Filey, chairman of the Toronto Carton Council, presided introducing Glen Turnbull, president of the association. Carlo Boehmer, of Kitchener, was master of ceremonies and an edifying address was delivered by A. R. Kaufman, widely known industrialist of Kitchener. George Hobart of London extended an invitation to the visitors to hold their next annual tournament in that city. The winners of the golf tournament were: low net, Norman Bennett; low gross, W. Kitchen; low three sealed holes, H. Hurd; high net, Fred Hunt; high gross, L. Dunbar. The horse shoe tournament was won by W. J. McIntyre and Fred Locke. The Hinde and Dauch trophy, which is usually contested for at each convention, was omitted this year owing to the fact that the Canadian Paper Box Manufacturers Association met jointly with the Association of the United States, in New York City a few weeks ago. C. V. Hodder, Toronto, secretary of the Canadian Association, after the presentation of the awards, made a few remarks on the current situation and stressed the need for closer unity during the present period of war conditions.

Australia To Use Local Pulp

After years of careful investigation it appears that the manufacture of pulp for newsprint, writing, wrapping, and fine papers, as well as the manufacture of paper from local pulp, will become an actuality in Victoria in the near future. Australian Paper Manufacturers, Limited, expects its paper pulp plant at Maryvale, Victoria, to commerce production shortly; Associated Pulp and Papers Mills, Limited, Burnie, Tasmania, is about to install its second paper making machine following the successful marketing of initial production; and the Australian Newsprint Mills, Proprietary Limited, Hobart, Tasmania, which is directed by a group of Australian newspaper interests, reports good progress with the construction of its plant in Southern Tasmania for the manufacture of newsprint.

Sorg Paper Co. Makes Improvements

The Sorg Paper Company of Middletown, Ohio, manufacturer for many years of Fourdrinier and cylinder papers, with a daily capacity of approximately 250 tons, announces that it began a $250,000 improvement program about a year ago and that plans have been made for the completion of this program during the next year.

The primary purpose of this program is to insure the continuation of this company's position as one of the leaders among those mills making quality papers. Expenditures have been and will be made on all six machines that the company operates at Middletown, Ohio. Already the latest modern development in equipment for the cleansing of paper stock has been installed on the paper machines. Chlorination methods are being installed to meet modern demands for bacteria control. Automatic moisture control apparatus is being installed on machines making printing papers. Improved and additional refining machinery will be installed. The installation of special equipment for efficient and automatic handling of wood pulp in storage warehouses has been completed. Improved methods have been devised for the bulk handling of chemicals and other materials in the three mills embraced in the company property. A new smoke stack over two hundred feet high will be built for reducing fly ash from the centralized power plant of the company. Numerous additions and changes are being made in equipment in the finishing and other departments. Several new deep wells have been provided to assure an abundant water supply under the most severe conditions of drought. The manufacturing and technical departments have been enlarged to insure control over the various papers manufactured.

Appropriations have also been made for distinctive advertising of the various products of the company. These products include a wide variety of standard grades of Offsets, Index Bristols, Post Cards, high grade Tag Papers and numerous specialties. An infinite variety of papers are manufactured of rag stock, bleached and unbleached sulphite, soda pulp, bleached and unbleached sulphate, jute fibre and groundwood. With such a variety of raw materials available countless papers can be manufactured entirely of one grade or of several grades blended to meet certain conditions for specialty papers. Only the finest of raw materials are chosen for use in Sorg papers. The company has purchased some equipment and will purchase additional modern equipment for the conversion of high grade facial quality toilet tissue.

These expenditures by one of the outstanding companies in the paper manufacturing business is indicative of the faith it has in the future of the paper business in this country.

Opens Chicago Office

The Conway Building, 111 W. Washington Street, continues to grow as the paper center of Chicago with the announcement that Stanley Smith has opened offices on the eleventh floor of the building. Mr. Smith formerly was affiliated with the Seibert Paper Company handling the lines of the Groveton Paper Company. Mr. Smith is now reported to be handling the Groveton sales direct from his new headquarters.

Greater Demand Encourages Chicago Trade

Early Wave of Speculative Buying Recedes But A Substantial Demand For Many Grades of Paper Is Reported In Midwest Area—To Discuss Injuries In Paper Mills At National Safety Congress—Other Trade News.

[FROM OUR REGULAR CORRESPONDENT]

CHICAGO, Ill., October 9, 1939—There continues to be evidence that paper is in improved demand. Reports indicate that the early "hysteria" has more or less passed away but that there remains a substantial demand considered encouraging by the local paper industry. Recent announcements of the newsprint industry in connection with October prices have been considered as an excellent stabilizing factor in the trade. Kraft conditions are also considered favorable to a sane and orderly development of that market into higher ground. Increases in sulphite papers have likewise been reported as justified and in line with improvement generally. Book papers are substantially at higher levels with demand continuing strong though reported as subdued over the situation of a few weeks ago. Covers are sharing in this improvement. Groundwoods are firm and in good demand. Waste papers are strong with the strength in the higher grades attracting attention from students of economics in the paper industry. In general, the Chicago market is not so "boiled up" as last week and most local offices are reported to be utilizing the breathing spell to catch up.

Haering & Co. Moves Offices to Plant

D. W. Haering & Company offices have recently been moved to the plant at 2308 S. Winchester Avenue, Chicago. The water consultants, widely known in the manufacturing industry, made the move to secure increased office and sales space and to take care of expanded executive personnel. The laboratory maintained by the Haering organization will continue to be located at 3408 W. Monroe Street where the old offices are being altered to provide larger facilities for the research staff. The company was organized in 1931 to manufacture glucoside for scale and corrosion control. At the time announcement was made of the new location, the company also advised the trade that a new line of corrosion-resistant coatings for external application to metal surfaces had been developed. The product is prepared in several forms to meet varying temperature requirements and may be applied by brushing, spreading or spraying.

New State Sales Tax Ruling

Illinois paper merchants, and those outside the State as well, are interested in a recent ruling of the Department of Finance with reference to the Illinois sales tax. The ruling indicates that the department expects to hold liable for taxation all transactions outside the State in all instances where such merchandise, of similar specifications, might have been purchased in Illinois. However, such liability can only apply when the department has jurisdiction over a local or branch office within Illinois. The ruling, fortified by several court rulings on interstate shipments, is designed to discourage outside the state buying to escape sales tax payments. It is of direct interest to paper concerns in the purchase of supplies and other items of direct consumption from outside Illinois. As several have interpreted it, the rule means that unless goods not for resale can be purchased only outside the State and only under specifications available outside the State, the sales tax will hold. In effect, the rule does instigate some elements of the "use tax" into the sales tax picture in Illinois.

To Discuss Injuries in Paper Mills

D. D. Fennell, president of the National Safety Council with offices in Chicago, leaves next week for Atlantic City and the National Safety Congress to be held October 16 and 20. According to the local offices of the council, which are headquarters for the entire country, the paper industry will prominently participate in the program with several leading executives from paper mills scheduled to discuss various factors in safety work in the mills of the country. Included in the Paper and Pulp section program are discussions on "Back Injuries in the Paper Industry", "Value of Accident Statistics" and the "Supervisor's Place on the Safety Program". Major safety trophy awards will be made to winning paper mills during the convention week.

F. P. Vaughan to Continue with Bay West Co.

It is reported that F. P. Vaughan, president and general manager of the newly created Tested Papers of America with headquarters in Chicago, will maintain an active interest in the Bay West Paper Company of Green Bay, continuing to act as treasurer and director of the company. Mr. Vaughan will, however, devote the majority of his time to the setting up of a sales personnel for Tested Papers and to perfecting the merchandising procedure of that concern.

Paper Board Men Gratified at Good Report

Chicago paper board manufacturers and converters hailed with interest the recent government report that production of paper board in August totaled 443,226 short tons compared with 366,605 in July and 358,977 tons in August of a year ago. These figures were considered as proof of assertions made for some time that demand for paper board is well on the upgrade production, according to the report and for the eight months ended August 31 rose to 3,018,869 short tons from 2,420,848 short tons the first eight months of 1938.

Rockwell-Barnes Purchase Building

The Rockwell-Barnes Company, Chicago, recently announced the purchase of a one and one-half story building at 2815 Locust Street, St. Louis. The building covers a lot fronting 50 feet on Locust by a depth of 134 feet. The Chicago concern has maintained a branch office in the Missouri city for thirty years and will move into its greater accommodations on Locust street as soon as the alterations are completed and the equipment is installed.

Financial News of Pulp and Paper Industry

National Container Suits Pending In Florida Courts Dismissed — Increased Net Income For Champion — Brown Co. To Meet Obligations With Trustee Certificates — Consolidated Declares Dividend of 37½c.

New York Stock Exchange

High, Low and Last for the Week Ending October 11, 1939

	High	Low	Last
A. P. W.	2⅞	2⅞	2⅞
Armstrong Cork Co.	38	36½	37
Celotex Corp.	10⅜	10¼	10¼
Celotex Corp., pf.	58	58	58
Certain-Teed Products Corp.	7⅛	6¾	7
Certain Teed Products Corp., pf.	31	29	29¼
Champion Paper & Fibre Co.	27½	26½	26½
Champion Paper & Fibre Co., pf.	101½	100½	101½
Congoleum-Nairn Co.	22½	22	22⅜
Container Corp. of America	15⅝	14¾	15
Continental-Diamond Fibre Co.	8½	8	8⅜
Crown-Zellerbach Co.	15⅞	14¼	15
Crown-Zellerbach Co., pf.	88	87	87
Flintkote Co.	17⅞	17¼	17⅞
Robert Gair	5	4½	4½
Robert Gair, pf.	16½	14¾	15½
International Paper & Power	13⅞	12⅛	13
International Paper & Power, pf.	49½	45¼	47½
Johns-Manville Corp.	78¼	74¾	78
Kimberly Clark Corp.	35⅝	34	35
MacAndrews & Forbes	28½	28	28½
Masonite Corp.	36	34	36
Mead Corp.	12½	11⅛	12
Mead Corp., pf.	70	65½	70
Paraffine Companies, Inc.	42½	41½	42
Ruberoid Co.	18½	18	18
Scott Paper Co.	48⅜	45¾	48⅜
Sutherland Paper Co.	25	24½	25
Union Bag & Paper Corp.	12½	11¼	11¾
United Paperboard Co.	6⅞	6	6
U. S. Gypsum Co.	75⅝	73	75
U. S. Gypsum Co., pf.	158	155	158

New York Curb Exchange

High, Low and Last for the Week Ending October 11, 1939

	High	Low	Last
American Box Board Co.	8¼	8¼	8¼
Brown Co., pf.	22¾	19	22
Great Northern Paper	44	42	42
St. Regis Paper Co.	3¼	3¼	3⅜
Taggart Corp.	4½	4⅜	4⅜

National Container Suits Dismissed

Samuel Kipnis, president of the National Container Corporation of Long Island City, in a letter recently sent to stockholders says:

"We believe that you will be pleased to learn that all suits which were heretofore instituted and which were pending in the courts of Florida have been dismissed and that at this time there is no action of any kind instituted which is based upon the construction or the alleged effects of the operation of our mill in Jacksonville.

"It is, however, proper that we direct your attention to the fact that the Department of Justice has instituted an anti-trust action by way of indictment, in the District Court of the United States for the Southern District of New York, against 27 corporations, including your company, in the container industry, and 35 corporations in the Kraft Paper Industry and a number of individuals. It is our understanding that all firms involved will contest this action and are of the firm belief that there has been no violation of the law.

"Increase in the volume of sales during the first six months of the year has resulted in an increase in the company's earnings to 26 cents a share as compared with 16 cents a share for the same period last year. Figures for the third quarter of this year are not yet available, but our sales volume indicates continued improvement."

Champion Nets $320,377

Champion Paper and Fiber Company and subsidiaries report for sixteen weeks ended August 20, 1939, net income of $320,377, including $401,756 representing the net proceeds of life insurance policies, and after provision for depreciation, depletion, taxes, interest, etc. The above net income is equal, after dividend requirements on the 6 per cent preferred stock, to 32 cents each on 551,000 no-par common shares.

During the above period the company has valued its process and finished stock inventories at the Hamilton division in accordance with a new system of grade costing, which represents a change in policy, such change having the effect of increasing net income to the extent of $17,490.

Brown Co. to Issue Certificates

Trustees of the Brown Company, in process of reorganization, have been granted authority by United States District Court Judge John A. Peters to issue $250,000 in trustee certificates to pay present and future obligations resulting from wood contracts with the city of Berlin, N. H.

Ernest Maling, head of the company's accounting department, and Henry P. Carruth, general manager, told the court that as the result of conditions in Europe the company's business had increased so that it would be showing a favorable cash balance by the middle of October or first of November.

Consolidated Declares Dividend

[FROM OUR REGULAR CORRESPONDENT]

WISCONSIN RAPIDS, Wis., October 9, 1939—A dividend of 37½ cents per share was declared last week by the Consolidated Water Power and Paper Company for its third quarter operations of 1939. The dividend will be paid on stock held by about 450 stockholders, and compares with the previous quarterly dividends of 25 cents and 12½ cents paid by the company.

Sweden Makes More Corrugated Board

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., October 4, 1939—According to a brief comment on the increasing production of corrugated board in Sweden, published in the bulletin of the Swedish-International Press Bureau, Sweden's production of corrugated board and of boxes of corrugated paperboard has displayed a very rapid development in recent years, as shown from statistics published by the Swedish Board of Trade. In 1931 there were produced in Sweden 10,000 tons of corrugated board while in 1937 the production had risen by over 100 per cent to nearly 22,000 tons, with a value of nearly £464,000 (approximately $2,117,000).

Work on Hollingsworth & Whitney Mill

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., October 9, 1939—The construction of the Hollingsworth & Whitney Company's Chickasaw Mill at Mobile, Ala., for the manufacture of sulphate pulp and paper of standard and special grades is progressing rapidly. It is the result of more than two years of study and investigation. This will complement the existing facilities of the company in Maine where several million dollars have been spent in recent years in plant improvements and enlargements with a further development program now underway.

Work About Half Completed

As of mid-October it is anticipated that the work on the new mill will be about one-half completed. Production is planned to start early in 1940. It will be a completely integrated unit designed for approximately two hundred tons daily of high-grade brown, semi-bleached and fully bleached product.

It is the first manufacturing venture of Hollingsworth & Whitney Company outside of New England. Formed in 1862 as a partnership with a background in paper making extending back to the early nineteenth century, the company operated plants in the vicinity of Boston in its early years. It owned the first plant in the United States for the manufacture of paper bags located at Watertown, Mass. In 1873 it pioneered in Maine with the acquisition of mills at Gardner, and in 1891 started the construction of its great mill on the Kennebec River at Winslow, which today, with its ten sulphite digesters and six great paper machines is one of the largest high-grade specialty mills in the world. In 1909 the company took advantage of the fine power resources of the Kennebec River at Madison, Maine, by opening the Abenequis Mill for the production of fine-quality ground wood pulp.

After a thorough survey of potential mill sites along the Atlantic and Gulf coasts, company officials selected Mobile as offering the most outstanding location for present and future development. With service from five railroads, a deep water harbor, well-developed river system and progressive State Docks development, its transportation facilities are unexcelled. The company has received the whole-hearted cooperation of public and civic leaders of the city and state. Careful investigations indicated the availability of plentiful supplies of both wood and water without interference to existing industries. Fuel, an important manufacturing item, is available in the form of coal, oil, or gas.

Ideal Site for Mill

No small factor in the decision was the opportunity of obtaining a plant site of 135 acres fronting on Chickasawbogue—an estuary of the Mobile River with railroad and highway facilities and soil bearings of such excellence that a total of less than a hundred piles will be required for the entire mill and track structure. The site is ideally adapted for a straight line production layout, and is ample to provide for almost unlimited expansion.

One of the first subjects of study was the water supply. After ascertaining that ample water of high quality was available from both surface and subterranean sources, the Layne-Central Company was engaged to develop a well system.

Turning its attention to the design and construction of the plant, the company added to its paper making and engineering staff experienced men in the field of sulphate pulp production and bleaching and in construction of mills in the South. The constructing engineering services of Hardy S. Ferguson Company, who have previously done work for the company in the Maine mills, were obtained. The Rust Engineering Company, which has built several large Southern mills in recent years, was selected as contractors.

The ground was broken early in May, and by October the reinforced concrete foundations and flat slab floors had been poured. Steel work was going up and a complete yard track system has been laid, over which carloads of machinery were beginning to arrive.

To Produce Finest Pulp and Paper

Final selection of all equipment items has not yet been completed and details will be announced at a later date. Company officials have stated that its objective is the construction of a mill equipped to produce the finest pulp and paper product in the South, and all machinery will be purchased with this in mind.

Paper Men Urge Conservation

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., October 9, 1939—R. A. McInnis, president of the Canadian Pulp and Paper Association, in a letter made public by the Canadian Forestry Association, urges that forest conservation be kept actively and continuously in the foreground, especially during the period of the war. He remarks:

"Very few people realize that at the outbreak of the last war Canada was just beginning, in a feeble way, to become an important pulp and paper manufacturing country.

"In 1913 Canada produced about 350,000 tons of newsprint and a few hundred thousand tons of other paper products. In 1937 Canada produced in newsprint and other paper products about 4,000,000 tons. That was a big year; but in 1939 Canada will produce in paper products of various kinds, including newsprint, about 3,500,000 tons.

"In addition, the production of groundwood and sulphite pulps has grown tremendously to meet a world wide market of prodigious growth.

"At this time, due to war conditions, there will be a terrific drain upon the products of our forests for lumber, pulp, paper and many others.

"We are the most important producers of forest products in the world today, with a market throughout the entire world. It is, therefore, tremendously important that every association connected with forest products, and the various governments and departments of governments, keep constantly and continuously in mind the importance of forest conservation and, at the same time economic forest utilization, because you cannot separate utilization from conservation."

Instrumentation Studies. XXXIII.

Penetration of Papers by Liquids and Solutions*

Part III: The Larocque Surface Oil Absorption Test

By The Staff of The Institute of Paper Chemistry

Abstract

The apparatus and procedure for the Larocque Surface Oil Absorption Test are described. The effects of temperature, humidity, and pressure of application of the oil upon the observed absorption times are discussed. The reproducibility of absorption times is studied and undesirably large variations are noted. These variations are attributed primarily to inadequate sampling (an inherent characteristic of the test), to the subjective nature of the end point, and to possible effects of the pressure of application of the oil. Because of this lack of complete reproducibility, the test fails to rank samples consistently. It is observed that the oil penetrates a considerable fraction of the sheet during a test. This fact and the observed correlation between the ranking of samples by this test and by the oil drop test suggest that the two tests may deal with somewhat similar paper properties.

Many properties of paper are known to vary from point to point through a sheet. Because of this variation, it is sometimes convenient to distinguish between surface, internal, and average properties. A particularly good illustration of the situation arises in the evaluation of papers for printing. Since oils are important constituents of printing inks, the affinity of paper for oils is a matter of importance and several tests have been suggested and used for the evaluation of the oil resistance or oil absorptiveness of paper. However, since printing is primarily a surface process, it seems likely that a test of surface oil absorptiveness would show better correlation with printability than would a test for average absorbency through the whole sheet.

Wemhoff[1] has described a test for surface absorptiveness in which a drop of oil is rolled out into a thin layer on the paper surface. The surface absorptiveness is measured either by the time required for the disappearance of the oil surface or by the area of the spot.

[1] Wemhoff, B. L. Evaluation of the printing quality of paper. *Paper Trade J.* 100, no. 6:41-44 (Feb. 7, 1935).

[2] Larocque, G. L. The oil-paper relationship in the printability of paper. *Pulp Paper Mag. Can.* 38, no. 2:77-84 (Feb., 1937).

[3] Larocque, G. L. Laboratory methods for measuring the printing quality of paper. *Pulp Paper Mag. Can.* 39, no. 2:99-105, 123 (Feb., 1938).

[4] Larocque, G. L. General laws governing the oil-resistance of paper in printability. *Pulp Paper Mag. Can.* 39, no. 2:106-119 (Feb., 1938).

The surface oil absorption test which is the subject of this report was developed by Larocque[2, 3, 4] during his studies of the printing qualities of papers. He describes the purpose of the test as follows:

"This test was devised for measuring an important but hitherto indeterminate printing property of paper, namely: The absorptiveness of the paper surface for a thin film of oil, of the same order of thickness as that present in the printing process (i.e., a film 0.002 to 0.006 mm. thick).

"By means of this device, a thin and reproducible film of any suitable oil is placed on the surface of the sheet of paper, or of the paper-board that is to be tested. The oil film is then examined by reflected light and the time required for its complete disappearance into the sheet is considered to be a measure of the 'absorptiveness' or 'absorptivity' of the paper *surface.*"

He adds in his conclusion[2]:

"This new oil absorption test gives widely different absorption times on different classes of paper which is in accordance with their behavior towards printing ink. It is capable of distinguishing between samples of the same grade differing only slightly in oil absorbency and it is extremely sensitive to changes in stock hydration as produced by beating."

This report describes the results of a study of this surface oil absorption test with regard to the general technique of the test, the reproducibility of results, the agreement among observers, the consistency with which any group of samples is ranked, and the correlation of the results of this test with those of the oil drop test. The application of the test to the evaluation of the printability of papers is not considered. The instrument used in this study was kindly loaned by the Forest Products Laboratories, Dominion Forest Service, Department of Mines and Resources, Montreal, Canada.

SECTION I—Description of Apparatus and Procedure

Apparatus

The apparatus used in the test consists of a device for applying a film of oil, a sample holder, and a viewing box. The film of oil is applied to the paper by means of the device shown schematically in Fig. 1. A fine glass capillary tube, *C*, is connected to a steel tube, *S*, fitted with a screw piston. The volume of the tube above the piston is filled with mercury. This mercury seals the piston so that oil may be drawn into or extruded from the capillary in amounts indicated by displacements of the mercury meniscus along the scale engraved on the capillary tube. The meniscus is observed through a reading glass. The tip of the capillary tube is finely ground to a small flat surface having an area of 7.07 sq. mm. in this particular instrument. When the mercury meniscus is advanced one division, a small quantity (0.000037 cc. for this instrument)[5] of oil is extruded. This extruded oil appears to form a thin film covering the ground tip of the capillary tube.

The sample holder consists of a wooden block hav-

* Part I of this series will be a theoretical discussion of the penetration of papers by liquids and solutions. Part II is Instrumentation Studies XXVI, *Paper Trade J.* 105, no. 26: 35-42 (Dec. 23, 1937).

[5] This is the average volume of oil extruded when the meniscus moves through one scale division. It was determined by transferring two groups of twenty of these oil films to a piece of paper and observing the increase in weight. If this volume of oil was spread uniformly over the ground tip of the capillary, the thickness of the film would be 0.0052 mm.

ing one face (approximately 2 by 5 inches) covered with a thin rubber pad. The sheet of paper to be tested is laid on this pad and held in place by a metal frame.

The viewing box contains an incandescent lamp, a copper sulphate filter to absorb infrared radiation, an opening for insertion of the sample and holder, and a viewing aperture. Light from the lamp passes through the copper sulphate filter and through a limiting aperture before striking the sample. The illuminated sample is observed through the viewing aperture. Provision is made for mounting a thermometer so that its bulb is about one inch above the sample.

PROCEDURE

All samples were conditioned for at least 15 hours and all tests were carried out in a constant humidity room at a temperature of 21.1 deg. C. and at a relative humidity of 65 per cent.

The mercury meniscus was brought to the tip of the capillary tube by adjustment of the piston. The tip of the tube was immersed in a small vessel of castor oil and the oil was drawn into the capillary by retracting the piston. When the desired amount of oil had been drawn in and the mercury meniscus left at a suitable place, the tip of the capillary was wiped clean. The sample of paper to be tested was mounted in the holder. One drop of oil was extruded by moving the mercury meniscus through one scale division, and the sample was then pressed firmly against the tip of the capillary tube; care was taken to hold the sample parallel to the ground surface of the tip. At the instant of contact the stop watch was started. The sample was then placed in the viewing box. At first the oiled area appeared as a shiny spot, but later only one or more bright points of light were seen; the end point was reached and the watch was stopped when the last bright point disappeared. The elapsed time constituted one observation of absorption time, hereafter called an individual absorption time. Ten such observations were made on each specimen with oil spots distributed over an area approximately 0.75 by 1.25 inches. The average of these ten absorption times constituted one determination of surface oil absorbency and is referred to as an average absorption time. In general, three determinations of absorbency were made on each specimen (2 by 5 inches) of a sample. The temperature registered by the thermometer was recorded with each observation of absorption time.

The above procedure is essentially that recommended by Larocque[2].

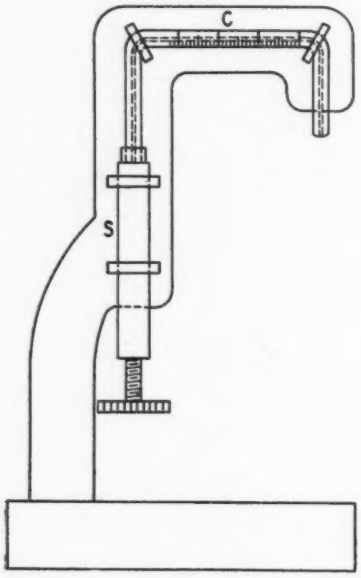


FIG. 1.
Surface Oil Absorption Apparatus

SECTION II—Factors Affecting the Experimental Procedure

EFFECT OF TEMPERATURE

Absorption times depend upon the temperature at which absorption takes place, because of the large temperature coefficient of viscosity of castor oil. Larocque[2] has reviewed the simple capillary picture of the penetration of oil through paper and has shown that, for the conditions of this test, the absorption time should be proportional to the ratio of the viscosity to the surface tension of the oil. Since the viscosity of castor oil changes about twenty times as rapidly with temperature as does the surface tension, the viscosity is the important factor in determining the effect of temperature changes upon absorption times. Hence, for the temperature changes usually found in practice, it seems reasonable to consider the absorption time to be proportional to the viscosity of the oil.

In order to compare the oil absorbencies of different samples, it is necessary that the absorption times be determined at the same temperature or that there be a means of converting the values obtained at any temperature to the corresponding values at a standard temperature. Such a conversion to a standard temperature may be accomplished by means of the following equation, which follows immediately from the proportionality of absorption time to temperature discussed above:

$$\frac{t_0}{} = \frac{(t\ \eta_0)/\eta}{\eta};$$

t is the observed absorption time and η is the viscosity of the oil at the experimental temperature T; t_0 is the corresponding absorption time and η_0 is the viscosity of the oil at the standard temperature T_0.

Larocque[2] has presented a convenient table of factors by which the absorption time at any temperature between 18.0 and 27.9 deg. C. may be multiplied to obtain the corresponding absorption time at 21.1 deg. C. The importance of controlling and knowing the temperature of the sample during the absorption process is appreciated when it is noted that the viscosity changes by approximately 9 per cent per degree C. change in temperature.

In spite of the fact that observations were made in a constant-temperature room and although a filter was used to absorb infrared radiation, the lamp dissipated enough heat to raise the temperature of the viewing box as much as five degrees above room temperature. The extent of this temperature rise depended upon the length of time the lamp had been on. This was an unsatisfactory condition, not because of the inconvenience of converting observed absorption times to the corresponding values at the standard temperature of 21.1 deg. C., but because the temperature

at which absorption occurred was variable and indeterminate.

This uncertainty in temperature may be explained by considering the temperature changes in the sample. The oil is applied to the sample at room temperature and the sample is placed in the viewing box, whereupon the temperature of the sample begins to rise. If the absorption time is short, *e.g.*, 5 seconds, this temperature rise may be insignificant. If the absorption time is long, *e.g.*, 5 minutes, the temperature of the sample may rise to the temperature of the box. For absorption times of intermediate length the final temperature of the sample will be between room temperature and that of the box. Thus, the effective temperature is unknown and the observed time cannot be properly converted to the value corresponding to the standard temperature.

The temperature difference between the viewing box and the room may be minimized by circulating air through the sample opening with a fan. At the beginning of this study a number of observations were made without such circulation of air. However, in view of the considerations presented above, it soon seemed imperative that the temperature control be improved and thereafter the fan was used and the temperature difference between room and box was kept below 1.5 deg. C. This temperature difference was still unsatisfactorily large, but it was the smallest obtainable with the apparatus. It would seem that, ideally, the difference should be no more than 0.1 deg. or possibly 0.2 deg. C. The trouble could easily be eliminated by mounting the lamp in a housing entirely separated from the viewing box proper.

All absorption times recorded in this report have been converted to values corresponding to a temperature of 21.1 deg. C., unless otherwise noted. When the temperature changed by less than 0.5 deg. during the time required for the ten observations, the average time was computed and converted to the corresponding value at 21.1 deg. C. When the temperature change during the ten observations was greater than 0.5 deg., the individual times were reduced to the standard values and the average of those values was computed.

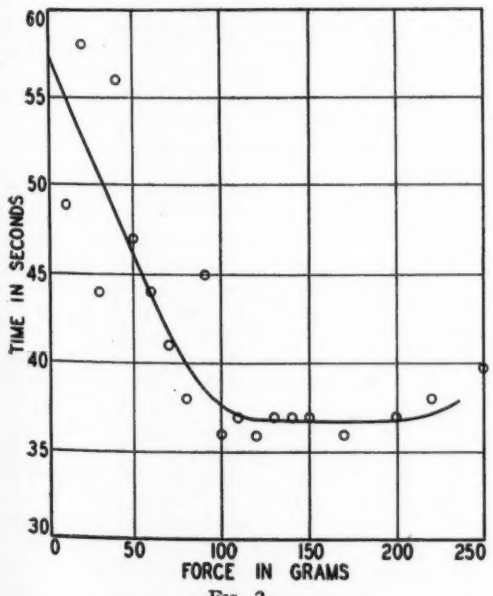


FIG. 2.

Surface Absorption Time vs. Pressure of Transference E. F. Book, No. 6, Wire Side

EFFECT OF HUMIDITY

Larocque[2] reported that the surface oil absorption time decreases with increase in relative humidity and shows marked hysteresis effects when the relative humidity is decreased. The effects of changing relative humidity were not studied in the present investigation. As mentioned previously, all tests were carried out at a relative humidity of 65 per cent.

EFFECT OF PRESSURE OF TRANSFERENCE OF OIL

Larocque[2] recommended that a moderate but firm pressure be exerted between sample and capillary tip when the oil film is transferred. The effect of pressure between sample and capillary tip was investigated in the following way: The sample holder was placed on one pan of a trip scale and the scale was so adjusted under the capillary tip that, when it was in equilibrium, the tip lightly touched the sample. With the sample out of contact with the tip, a known weight was placed on the opposite pan of the balance, a drop of oil was extruded from the capillary, and contact between sample and tip was gently effected. After an instant, the pressure was relieved and the sample was placed in the viewing box for observation. Absorption times were thus obtained for an English finish book paper for weights ranging from 10 to 250 grams, i.e., for forces of contact ranging from 10 to 250 grams or for pressures ranging from 2 to 50 pounds per square inch. The results are shown in Fig. 2.

It is seen that the observed absorption times decreased with increasing force of contact until a force of about 100 grams was used. For forces between 100 and 220 grams the absorption times were essentially independent of the force of contact. It was judged that the force normally used in manually effecting contact between tip and sample was in this range.

Although a further study of this effect seemed outside the scope of this report, it appears evident that the shape of the curve must be dependent upon the characteristics of the particular paper under test, *e.g.*, upon smoothness and compressibility. If a sample is rough, a particular force of contact may not be sufficient to level the "hills" and "valleys" of the surface and only the "hills" will be coated with oil. This film of oil will be thicker and the observed absorption time longer than if the oil were spread over a greater area. A greater force of contact may smooth the surface enough to allow a greater proportion of the surface to be coated, resulting in a thinner film and a shorter absorption time. The horizontal portion of the curve may indicate the range of forces of contact through which the area of contact and, hence, the thickness of the oil film is independent of pressure. For a very smooth paper the area of contact and, hence, the absorption time might be independent of the force of contact over a very wide range of forces. The surface of a highly compressible paper would be leveled by smaller forces than would that of a paper of low compressibility.

MISCELLANEOUS REMARKS

The particular viewing box used in these experiments was so constructed that most of the light which was specularly reflected from the sample fell just above the viewing aperture. It was necessary to tilt

the sample block slightly toward the observer in order to observe the specularly reflected light and so obtain conditions for optimum sensitivity in deciding on the end point.

In the process of filling the absorption pipette, the mercury column was run to the end of the capillary (or as far as necessary to insure a continuous oil column to the tip), the tip was immersed in the oil, and the piston was very slowly screwed out in order to draw in the oil. A difficulty occurred in trying to maintain an unbroken mercury column with a sharp meniscus. The mercury in the horizontal section of the capillary tended to draw out to a thread-like or beaded column covered with oil. This occurred frequently, even with an excessively slow rate of flow. It was usually necessary to draw the mercury and oil back into the cylinder in order to reunite the column and obtain a sharply defined meniscus.

It was found that the oil was almost completely removed from the capillary tip by a single contact with the sample. If the sample was touched to the tip a second time, with no adjustment of the piston, at most only one or two small spots of oil could be noted on the sample.

The metal frame on the sample holder originally reflected a disturbing amount of light into the viewing aperture. This trouble was eliminated by giving the frame a dull black finish.

SECTION III—Reproducibility of Results

SAMPLES

The samples used in this study are described in Table I.

TABLE I.—DESCRIPTION OF SAMPLES

Sample	Classification of Sample	Caliper (inches)
1	Mimeo	0.0050
2	Mimeo	0.0039
3	Mimeo	0.0050
4	News	0.0037
5	News	0.0031
6	E.F. Book	0.0044
7	E.F. Litho	0.0043
8	M.F. Book	0.0033
9	M.F. Book	0.0029
10	S.C. Book	0.0036
11	Offset Book	0.0055
12	Dullcoated Book	0.0055
13	Glosscoated Book	0.0034
14	Tag Board	0.0118
15	Tag Board	0.0106
16	Tag Board	0.0129
17	Tag Board	0.0101
18	Tag Board	0.0114
19	Tag Board	0.0110
20	Coated Book	0.0034
21	Coated Book	0.0030
22	Coated Book	0.0035
23	Coated Book	0.0046
24	S.C. Book	0.0027
25	Coated Book (felt side only)	0.0031

REPRODUCIBILITY OF INDIVIDUAL ABSORPTION TIMES

The variations among individual observations for three typical samples are shown in Table II. In this table the first column for each sample lists the original observations; the second column lists the corresponding values after conversion to the standard temperature of 21.1 deg. C.

The variation among the values listed is considerable but is typical of measurements of many paper properties. The probable error of a single determination and the probable error in per cent were calculated and are listed in Table II. It will be recalled that the probable error (r) of a single observation is the number which the actual error may with equal probability fall under or exceed. It is calculated from the following formula:

$$r = 0.6745 \sqrt{(\Sigma x^2)/(n-1)}$$

TABLE II.—TYPICAL INDIVIDUAL OBSERVATIONS OF SURFACE OIL ABSORBENCY

Absorption Times in Seconds

Sample 3 Felt Side Observer B		Sample 6 Wire Side Observer A		Sample 15 Wire Side Observer B	
Uncor.	Cor.	Uncor.	Cor.	Uncor.	Cor.
4	4	32	35	215	234
6	6	43	47	197	213
5	5	32	35	250	265
7	8	31	34	199	211
3	3	33	36	142	153
4	4	28	31	145	161
4	4	25	28	293	319
4	4	37	41	375	408
3	3	34	37	320	348
4	4	40	44	219	232
Avg. 4.4	4.5	34	37	236	254
P.E.*	1.0		3.9		55.9
P.E.%	22.2		10.6		21.9

* P.E. = probable error.

where x is the actual error (i.e., the difference between an individual observation and the mean of all the observations), and n is the number of individual observations.

REPRODUCIBILITY OF AVERAGE ABSORPTION TIMES

One criterion of the value of measurements of this sort is their usefulness in ranking papers according to suitability for some particular purpose, *e.g.*, printing. This usefulness is determined by the consistency with which ranking can be effected; this, in turn, is dependent upon the reproducibility of the results. Larocque[2] made the following claim with regard to his test for surface oil absorbency: "If sufficient care is taken in the observation of the end point, and in making the temperature correction, it is possible to reproduce results on the same sample of paper with an accuracy better than 10 per cent."

The reproducibility of this test was studied by examining the agreement between determinations made on the same specimen (one 2 by 5 inch piece of the sample) of a given sample by one observer, on different specimens of the same sample by one observer, and on different specimens of the same sample by different observers. Each test consisted of a series of three average absorption time determinations which were made consecutively on the same specimen of the sample.

Each of the three observers familiarized himself with the apparatus and technique by making at least 100 individual observations, distributed among several different types of papers, before any values recorded in this report were obtained.

The absorption times for a number of typical printing papers and several lightweight boards are presented in Table III. In the columns designated by the numbers 1, 2, and 3 are listed the average absorption times for three consecutive sets of ten observations obtained for adjacent areas on a single two by five inch piece of paper. The columns marked *mean* list the means of the preceding three average absorption times. The columns marked 1′, 2′, and 3′ are the percentage deviations of the indicated values from the corresponding mean. The asterisks following numbers in the *mean* column indicate that the preceding three average absorption times were obtained when the temperature of the viewing box was more than 1.5 deg. C. above room temperature. The entries "less than 3 sec." which appear after samples 3 and 4 mean that the end points were reached before the samples could be placed in the viewing box after application of the oil. The operation of applying the oil and placing the sample in the box required a minimum of 3 sec. All values

in the table are rounded off to the nearest whole number.

Consideration of the percentage deviation of each average absorption time from the mean of its group of three values shows that 54 of the 218 listed values (i.e., 25 per cent) deviate by percentages ranging from 10 to 33 per cent. The frequency with which relatively large deviations occur among the shorter absorption times (*e.g.*, less than 10 sec.) is understandable, since the precision with which those absorption times can be determined is limited by the necessity of hurrying the application of the oil and the placing of the sample in the viewing box and by the shortness of the time available for accommodating the eye to the lighting conditions within the box. The deviations are less than 10 per cent for each of the three values in a group of average absorption times in only 42 of the 73 groups (i.e., in 58 per cent of the groups). It seems reasonable to conclude that, in general, an observer cannot expect to reproduce observations on a given sample within 10 per cent.

The average absorption times given in columns 1, 2, and 3 of Table III represent determinations made on the *same* specimen of paper by the same observer. The reproducibility of results obtained by one observer on *different* specimens of the same sample is illustrated in Table IV, which summarizes data already shown in Table III. In order to give values as truly representative as possible for the observer, the mean of three average absorption times is used for comparison. The percentage deviation is 100 times the difference of the mean absorption times divided by their average.

TABLE IV—SURFACE OIL ABSORBENCIES OF DIFFERENT SPECIMENS BY ONE OBSERVER

Sample	Observer	Mean absorption times in seconds		Average	Deviation, per cent
1-wire	B	6	7	6.5	15
1-felt	B	11	8	9.5	32
6-wire	A	37	36	36.5	3
6-wire	C	28	36	32.0	25
7-wire	C	33	36	34.5	9
7-felt	B	83	53	68.0	44
11-wire	B	73	73	73.0	0
11-felt	B	33	33	33.0	0
12-wire	B	245	275	260.0	12

It will be noted from the entries in Table III that most of the samples were examined by at least two observers. A valuable but all-too-infrequently found feature of tests of this sort is the possibility of the duplication of results on the same sample by differ-

TABLE V.—COMPARISON OF SURFACE OIL ABSORBENCIES DETERMINED BY DIFFERENT OBSERVERS
(Time in Seconds)

Sample	Wire Side Observers A	B	C	Per cent dev.	Felt Side Observers A	B	C	Per cent dev.
1	...	6.5*	12**	59	...	...	...	...
2	14	15	...	7	27	23	...	16
3	...	...	...	...	14	6	...	80
5	14	25	...	56	12	17	...	34
6	36*	...	32*	12	44	44	...	0
6	36*	36	...	0	...	...	...	...
6	...	36	32*	12	...	...	...	...
7	...	39	35*	11	...	68*	49	32
8	...	...	...	...	...	32	74	79
10	...	95	101	6	...	114	101	12
10	...	...	...	...	79	114	...	36
10	...	...	...	...	79	...	101	24
11	62	73*	...	16	...	...	...	...
12	255	260*	...	2	322	344	...	7
14	93	72	...	25	83	43	...	63
15	239	258	...	8	205	249	...	19
16	79	74	...	7	84	48	...	55
17	164	166	...	1	175	175	...	0
18	199	133	...	40	239	151	...	45
19	290	279	...	4	229	218	...	5

* Average of 60 observations (i.e., 6 average absorption times)
** Average of 20 observations (i.e., 2 average absorption times)
The percentage deviation is 100 times the difference of the mean absorption times divided by their average.

TABLE III.—SURFACE OIL ABSORBENCIES OF A NUMBER OF TYPICAL PAPERS AND BOARDS
Average Absorption Times in Seconds

Sample	Observer	Wire Side 1	1'	2	2'	3	3'	Mean	Felt Side 1	1'	2	2'	3	3'	Mean
1	B	8	33	5	17	5	17	6*	11	0	13	18	10	9	11*
	B	5	29	7	0	8	14	7	8	0	7	12	10	25	8
	C	12	0	11	8	..	..	12*	..	..	..	..	..	..	..
2	A	13	7	16	14	14	0	14	28	4	24	11	28	4	27
	B	15	0	15	0	14	7	15	23	0	24	4	23	0	23
3	A	less than 3 sec.							15	7	13	7	13	7	14
	B	less than 3 sec.							8	33	5	17	5	17	6
4	A	less than 3 sec.							less than 3 sec.						
	B	less than 3 sec.							less than 3 sec.						
5	A	15	7	11	21	16	14	14	11	8	15	25	9	25	12
	B	27	8	23	8	24	4	25	16	6	17	0	19	12	17
6	A	37	0	37	0	37	0	37	45	2	41	7	46	4	44
	A	36	0	38	6	35	3	36	..	..	..	..	..	..	..
	B	38	6	34	6	35	3	36*	48	9	42	4	43	2	44
	C	29	4	26	7	29	4	28	..	..	..	..	..	..	..
	C	39	8	33	8	35	3	36	..	..	..	..	..	..	..
7	B	39	0	42	8	37	5	39*	85	2	84	1	79	5	83*
	B	..	..	..	..	..	..	..	52	2	55	4	53	0	53
	C	35	6	32	3	33	0	33*	52	6	49	0	47	4	49*
	C	38	6	35	3	35	3	36	..	..	..	..	..	..	..
8	B	25	14	28	3	33	14	29	31	3	28	12	38	19	32
	C	..	..	..	..	..	..	..	78	5	72	3	72	3	74*
9	B	28	4	27	0	27	0	27	25	4	26	0	27	4	26
10	A	..	..	..	..	..	..	..	84	6	84	6	68	14	79*
	B	81	15	95	0	109	15	95*	104	9	114	0	123	8	114*
	C	99	2	99	2	105	4	101*	95	6	101	0	107	6	101*
11	A	62	0	63	2	60	3	62*	..	..	..	..	..	..	..
	B	74	1	77	6	69	6	73	28	15	37	12	35	6	33
	B	75	3	78	7	65	11	73*	36	9	31	6	32	3	33
12	A	254	0	282	11	230	10	255*	385	20	307	5	274	15	322*
	B	236	4	240	2	259	6	245	274	20	390	13	368	7	344*
	B	260	6	269	2	295	7	275	..	..	..	..	..	..	..
13	A	630	8	524	10	600	3	585*	..	..	..	..	..	..	..
14	A	87	6	96	3	95	2	93	99	19	88	6	61	26	83
	B	90	25	67	7	58	19	72	49	14	42	2	39	9	43
15	A	198	17	294	23	225	6	239	185	10	172	16	259	26	205
	B	255	1	254	2	264	2	258	257	3	233	6	257	3	249
16	A	71	10	90	14	77	2	79	79	6	89	6	83	1	84
	B	86	16	64	14	72	3	74	48	0	50	4	45	6	48
17	A	192	17	151	8	148	10	164	181	3	157	10	188	7	175
	B	169	2	173	4	155	7	166	171	2	183	5	170	3	175
18	A	208	4	202	2	188	6	199	277	16	183	23	256	7	239
	B	145	9	123	8	131	2	133	153	1	132	13	167	11	151
19	A	292	1	354	22	223	23	290	222	3	234	2	230	0	229
	B	290	4	276	1	272	2	279	179	18	203	7	271	24	218

ent observers, particularly by observers in different laboratories. The mean values for 30 individual absorption times (unless otherwise noted) included in Table III are presented in Table V in a form more suitable for comparing the results obtained by different observers. The means of series of three determinations, rather than the values for single average absorption times, are used in order to obtain values as truly representative of a given observer as possible.

Comparison of Tables IV and V shows that the deviations between the results for the same sample by different observers tend to be slightly greater than the deviations for the results by a single observer. The deviations between the results by different observers are sufficiently large to render questionable the assignment of a numerical value for the absorbency of a sample except possibly for the ranking of a group of samples by a given observer.

The following appear to be the most important factors contributing to the lack of reproducibility of results: Nonrepresentative sampling, subjective nature of the end point, and nonuniform force of contact at the time of oil transfer. Although reasonable care was exercised in avoiding obvious blemishes and watermarks in the paper, the area "sampled" by the ten spots used in obtaining one average oil absorption time was too small to constitute a fair sample of the paper. Each oil spot was only 3 mm. in diameter (an area of 7.07 sq. mm.) so that the ten spots used to obtain the average time had a total area of only 70.7 sq. mm. or about 0.11 sq. in. In common with all tests employing visual end points, this test suffers because of the difficulty of deciding when the last glimmer of light reflected from the oil spot disappears. It is not only difficult for one observer to be consistent in his choice of end point, but it is more difficult for two or more observers to adopt the same end point. The effect of force of contact between paper and capillary tip upon absorption time was discussed earlier in this report. It is obvious that the reproducibility of observations for a particular paper would be poor if the actual forces of contact fell in the range in which the absorption times were sensitive to forces of contact.

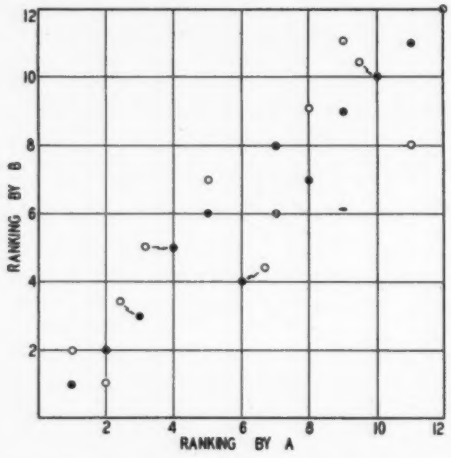


FIG. 3.
Correlation Between Rankings by Two Observers
O Wire Side. ● Felt Side.

SECTION IV—Ranking of Samples by the Surface Oil Absorption Test

The consistency with which a group of samples can be ranked by this test is closely related to the reproducibility of the results of the test, and the poor reproducibility demonstrated in Table III is reflected in the failure of the test to rank samples uniquely. Tables VI and VII present data from Table III in a form more convenient for illustrating this characteristic of the test. Table VI shows three separate rankings of each of three groups of samples by each of two observers.

TABLE VI.—RANKING OF SAMPLES BY THE SURFACE OIL ABSORPTION TEST

	Wire Side						Felt Side					
	Observer A Sample			Observer B Sample			Observer A Sample			Observer B Sample		
Rank												
1	..	..	..	..	..	..	4	4	4	4	4	4
2	..	..	..	..	..	..	5	3	5	3	3	3
3	..	..	..	..	..	..	3	5	3	1	1	1
4	..	..	..	..	..	..	2	2	2	5	5	5
5	..	..	..	..	..	..	..	..	..	2	2	2
1	16	16	16	16	16	14	16	14	14	16	14	14
2	14	14	14	14	14	16	14	16	16	14	16	16
3	17	17	17	18	18	18	17	17	17	18	18	18
4	15	18	18	17	17	17	15	15	19	17	17	17
5	18	15	19	15	15	15	19	18	18	19	19	15
6	19	19	15	19	19	19	18	19	15	15	15	19
1	6	6	6	8	9	9	6	6	6	9	9	9
2	11	11	11	9	8	8	10	10	10	11	8	11
3	12	12	12	6	6	6	12	12	12	8	11	8
4	13	13	13	7	7	7	..	..	..	6	6	6
5	..	..	..	11	11	11	..	..	..	7	7	7
6	..	..	..	10	10	10	..	..	..	10	10	10
7	..	..	..	12	12	12	..	..	..	12	12	12

It will be noted that in only three out of ten cases did a single observer rank a group of papers in the same order in three trials. In the thirty rankings of the three groups of papers and boards by the two observers there were six occasions in which one sample was out of order by one place and three occasions in which one sample was out of order by two places or two samples were out of order by one place. The first ranking by each observer was taken as standard. Table VII affords a better opportunity for comparing the rankings by two observers. The rankings were effected by means of the average absorption times for thirty observations.

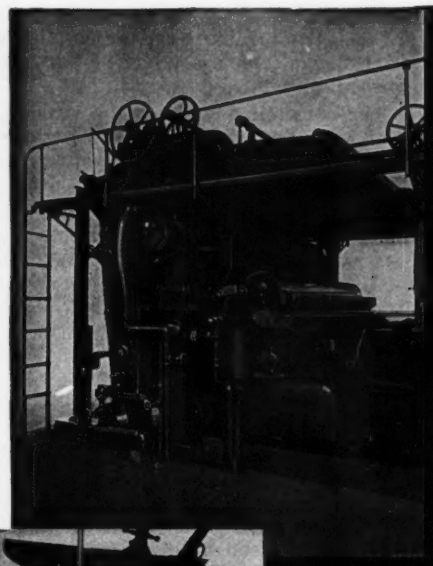
TABLE VII.—RANKING OF SAMPLES BY SURFACE OIL ABSORPTION TEST

	Wire Side		Felt Side	
Rank	Observer A Sample	Observer B Sample	Observer A Sample	Observer B Sample
1	2	2	5	3
2	5	5	3	5
3	6	6	2	2
4	11	14	6	14
5	16	11	10	6
6	14	16	14	16
7	17	18	16	10
8	18	17	17	18
9	15	15	15	17
10	12	12	19	19
11	19	19	18	15
12	..	..	12	12

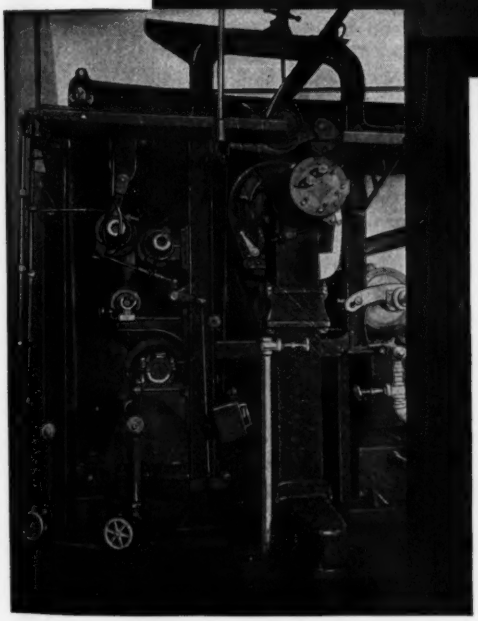
The rankings by the two observers are seen to differ. The inversions are particularly serious for the felt-side rankings. The correlation between the rankings by the two observers is illustrated in Fig. 3.

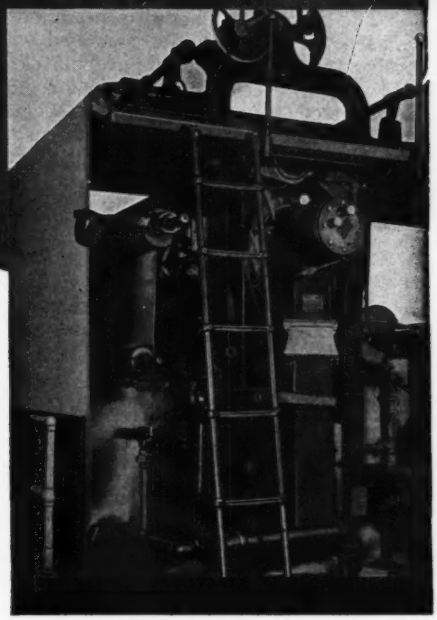
SECTION V—Effect of Size of Drop and Comparison of Larocque Test with the Oil Drop Test

It was noted that in many cases the oil appeared to penetrate to a considerable depth in the sheet. This prompted the trial of smaller drops of oil in order to accent the effect of the surface oil resistance of the sheet. Larocque[4] has estimated the minimum depth to which the oil from a single drop may penetrate from considerations of the available volume of



BELOIT SUCTION *Drum Press*





Results: Equivalent to suction drum and suction primary press combined

An absolute necessity on every board machine

Superior to all other methods of water removal on wet felts. • There must be a reason for over thirty of these rolls.

Ask the mills who installed them.

THE BELOIT WAY BELOIT IRON WORKS PAPER MACH'Y BELOIT, WIS. **IS THE MODERN WAY**

BELOIT IRON WORKS, Beloit, Wisconsin, U. S. A.

the voids and pores which must be filled by the oil. He has suggested the use of smaller drops, i.e., drops of half the usual size. Half drops were used but it was found that many of them failed to cover the surface of the sample uniformly.

In the attempt to use half drops, it was noted that the method of extruding the oil had a pronounced effect upon the absorption time. It was thought that perhaps a half drop did not spread evenly over the tip of the capillary, and, therefore, several readings were taken after the capillary tip was covered by extruding an excess of oil and drawing back all but the desired half drop. The absorption times so obtained were approximately 60 per cent of the times obtained after extruding only the half drop. No such difference was found when the two methods were used to extrude whole drops of oil. Since the half drops failed to cover the paper uniformly, as judged visually, no further study of them was made. However, the technique of extruding the oil should be considered if any future use or study of the test is made with half-drop quantities of oil.

The fact that marked penetration of the paper was noted in this study, combined with Larocque's[4] calculation of the minimum depth of penetration as 12 to 47 per cent for a particular offset and supercalendered paper, respectively, suggested that this surface oil absorption test and the usual oil drop test (in which the oil completely penetrates the paper) might have much in common. The most suitable method of comparing the two tests appeared to be a determination of the rankings of a group of samples by each test. Table VIII presents the data obtained from such a comparison. The oil drop tests were performed with the Fuess apparatus.

TABLE VIII

	Wire Side				Felt Side			
	Larocque		Fuess		Larocque		Fuess	
Rank	Sample	Time, Secs.	Sample	Time, Secs.	Sample	Time, Secs.	Sample	Time, Secs.
1	1	6	1	35	1	11	1	46
2	9	27	9	51	9	26	9	63
3	8	29	8	75	8	32	6	79
4	6	36	6	116	11	33	8	100
5	7	39	25	120	6	44	7	149
6	11	62	7	153	7	53	21	150
7	10	95	10	165	10	114	10	175
8	25	111	11	200	21	189	24	185
9	21	244	21	210	20	270	20	205
10	12	255	24	220	24	299	11	273
11	24	264	20	355	23	306	23	720
12	23	405	12	700	12	322	25	900
13	20	480	23	800	25	836	12	1420
14	22	1715	22	1500	22	1220	22	1800

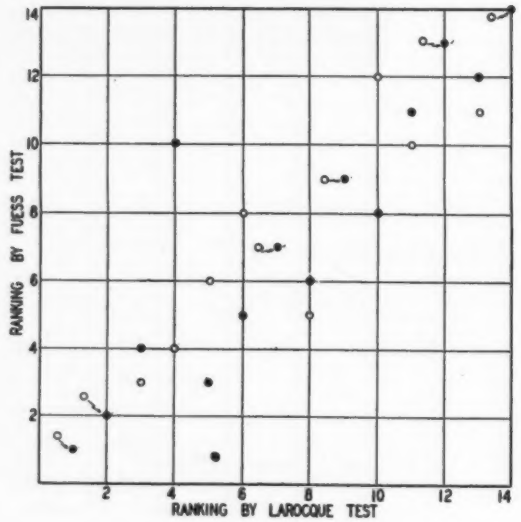


FIG. 4.
Correlation Between Rankings by Larocque and Fuess
O Wire Side. ● Felt Side.

The correlation between the rankings by the two tests is shown in Fig. 4. Although the correlation is not good, it is sufficient to warrant the conclusion that the Larocque test and the oil drop test deal with somewhat similar properties of the paper.

Pulp Investigation Discontinued

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., October 11, 1939—Due to conditions in Europe the United States Tariff Commission is not going further into the pulp situation unless ordered to do so, according to a letter sent to the Senate last week by the Tariff Commission.

Raymond B. Stevens, chairman of the Commission, sent the following letter to Vice President Garner in this connection:

"In August of this year the Senate passed Resolution 160, directing the Tariff Commission to make a report on wood pulp and pulpwood by April 15, 1940.

"Upon receipt of the resolution the Commission instituted an investigation designed to bring down to date the information contained in a comprehensive report on wood pulp and pulpwood submitted to the Senate in 1937. Preliminary inquiries indicate that the more conspicuous changes that have occurred since 1937 were the fall in United States exports of wood pulp to Japan, substantial additions to pulp producing capacity in this country, a marked decline in pulp prices, and generally depressed conditions in the domestic industry. Before the work of obtaining and analyzing complete information on these and other developments was far advanced, the situation in Europe led to disturbances of shipping from Sweden, Norway, Finland, and other European countries—countries which together in recent years have been supplying over two-thirds of the total imports of wood pulp into the United States. Freight and insurance charges on shipments from Europe have been sharply increased and there is much doubt as to what quantities of wood pulp can be delivered even at these increased charges. Under these circumstances the situation in wood pulp changed in the course of a few days from a buyers' to a sellers' market. Whether or not the conditions of the moment will continue, or be somewhat moderated, or be intensified during the remainder of the war period can not now be forseen. At any rate the conditions prevailing at the time the resolution was introduced do not now exist, and it seems unlikely that they will arise as long as the situation in Europe continues.

"In view of these circumstances, unless the Senate gives instructions to the contrary, the Commission proposes to withhold for the time being the completion of the report on wood pulp and pulpwood. We will, however, keep advised in regard to current conditions and report on them if at any time the situation seems to warrant such action.

B. E. Teale Goes With Crane & Co.

Benjamin E. Teale, for the past four years mill manager for the Ancram Paper Mills at Ancram, N. Y., is leaving Ancram to take a position with Crane & Co., Incorporated, in Dalton, Mass.

Indianapolis Prices Firm

[FROM OUR REGULAR CORRESPONDENT]

INDIANALOLIS, Ind., October 10, 1939—It is pretty well established that the price increases that were evident the first half of September are being maintained in this section, according to local paper jobbers, and it also is evident that the fortnight of speculative buying, particularly in the fine paper field, has been ended. However, the last week showed a fairly steady business in the fine paper field and jobbers are not worried about general conditions. It seems to be the opinion of most jobbers that general conditions have improved because of economic conditions at home and not because of the European situation as many believe. Demand for books, covers and ledgers, while slowing down the last of September, seemed to revive the last week and hope is held for a fair month. Prices are firm. Jobbers say they continue to have difficulty in receiving deliveries from the mills. Stocks in retail and wholesale hands when the general increase started, were very low and had been low for months. When the first signs became apparent that there might be a change in the situation, the mills also were caught short and deliveries in this territory have been handicapped.

Demand in the common paper field, including bags and wrapping paper, showed signs of further strength last week. Prices are firm. Most of the increase seems to come from the larger retail establishments, where business is reported to be improving rapidly.

Building paper demand has fallen off some during the last two weeks. It seems building operators are holding off until something more certain can be seen in Europe. This situation is true in all of the state's larger cities, but jobbers likely will not be caught with heavy stocks. Prices are being held firm. Container demand holds good and tissues are reported to be steady, both in demand and price.

Waste paper and rag demand is improving and prices are showing a slight increase. Local warehouses are being emptied to some extent on the increasing price.

Ladies Trade Auxiliary Meet

[FROM OUR REGULAR CORRESPONDENT]

PHILADELPHIA, Pa., October 9, 1939—The Ladies Auxiliary of The Philadelphia Paper and Cordage Association, comprising Mrs. E. K. Lay, Mrs. George K. Hooper, Mrs. Harry S. Platt, Mrs. E. L. Richards, Mrs. Lee Johnson, Mrs. J. R. Howarth, Mrs. David Wickerham and Mrs. Carroll Gardiner, met today at the headquarters of the Salvation Army, 222 South Third street, to formulate plans for a roast beef dinner to be given on Thursday, October 19th from 5:30 to 7:30 p.m. The dinner will be 50 cents and the proceeds will be for the benefit of the Settlement House and Day Nursery. Arrangements for parking facilities opposite 222 South Third Street where the dinner will be served, have been made by the Ladies Auxiliary.

Brigadier Brown and Mrs. Harry Cassard, cooperating with the Ladies Auxiliary, extend a cordial invitation to all those in the paper trade and their friends to attend this dinner, which will mean so much to the worthy poor and their little ones.

Philadelphia Bowlers Meet

PHILADELPHIA, Pa., October 9, 1939—The Philadelphia Paper Trade bowlers got off to a good start at the opening of their bowling season on Thursday evening last in Quaker City Bowling Alleys, Broad and Vine streets. Whiting-Patterson smashed the sticks for a big 1011 first game and 2769 total, taking three points from Riegert Rulers. Starring for the loser was Capaldi with 651, E. J. Spangler taking all four games from W. T. Peck sharing the lot of D. L. Ward Company, who also took 4 from J. E. Caldwell. J. R. Howarth was not far behind, winning 3 points from J. L. N. Smythe. Ten games of 200 or better were bowled throughout the league. The officers of the Philadelphia Paper Trade Bowling League are: W. T. Peck, W. T. Peck & Company, photo-engravers; J. Kline, Whiting-Patterson, secretary, and W. Gerhab, D. L. Ward Company, treasurer.

Japan Imports Less Pulp

WASHINGTON, D. C., October 9—The most important single factor in stimulating the search for substitutes for wood pulp in Japan undoubtedly has been the control exercised by the government through the Finance Ministry and the Ministry of Commerce and Finance.

Through the former office must be obtained permits to buy foreign exchange and it is an understatement of fact to say that these permits are not easily forthcoming. The strict control over the purchase of foreign exchange has resulted in the practical cessation of all imports which cannot be strictly classified as necessities in accordance with the present situation in Japan. Wood pulp is not so classified and therefore in the last year or so the amount imported has been drastically curtailed. Imports of wood pulp, which in 1937 amounted to 466,615 long tons, dropped to 143,782 tons in 1938. Figures for 1939 are available only for the first 5 months, but these also show a drop compared with 1938.

Boston Report Active Demand

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., October 9, 1939—Business in paper here is fully sustained among jobbers and paper manufacturers. Orders continue to pour into offices of manufacturers. The board market is firm with an upward tendency. All paper box manufacturers are busy with their customary fall and Christmas work. All box factories are operating to full capacity with prices firm and tending to advance, but manufacturers are trying to keep conditions on a healthy basis and are advising their customers to do likewise.

The paper stock market is fully as strong.

New Elevator for Scott Paper Plant

An addition to the storage building of the Scott Paper Company, Chester, Pa., will be equipped with a new freight elevator built by the Westinghouse Electric Elevator Company, it was announced this week.

The new installation, to be ready for service in December, features photo-electric self-leveling control, a load capacity of 10,000 pounds, and a speed of 100 feet per minute. It is the second to be installed by the Westinghouse Company. Stone & Webster Engineering Corporation, of Boston, are the consulting engineers and designers of the two-story addition.

Gair Employees Play Golf

On Saturday, September 30, employees of Robert Gair Company, Inc., New York City, gathered from a half dozen or more states at the Rockland Country Club at Sparkill, N. Y., to participate in their second golf tournament of the year. Approximately 60 were entered, including representatives from plants located at Newton Upper Falls, Mass., Cleveland, Ohio, Bogota, N. J., Brooklyn and Piermont, N. Y., as well as the Boston and Philadelphia sales offices. The New York office, of course, was there in full strength.

William Boyle of the New York office, the best golfer at the spring tournament, lost his title to James Galgano, the only entry from the mill department of the Piermont plant, who nonchalantly turned in a 77. Runners up in low scoring were W. H. Fish of the Boston office with an 86 and Fred England, New York office and Anthony Komornick, Piermont, who tied with 87's.

The highlight of the day was a match between a "Container" foursome made up of Messrs. S. R. Cahoon, manager of the Container Divisions, and William Boyle, New York office, Floyd C. Costello, manager of the Bogota plant, and Frank Newton of the Newton Upper Falls plant, against a "Folding Box" foursome consisting of Bob Ross of the Eastern States Carton Division, Brooklyn, F. R. Campbell of the Philadelphia sales office, W. H. Fish of the Boston sales office and Ed Sweeney of the New York office. The "Container" foursome repeated its success of the spring tournament, and in addition to being the best golfers, the "Container" foursome turned out to be the best showmen. They arrived with handsome green golf bags made of corrugated board with red lettering the length of the bags reading "Container Division".

It was suspected that this was the master stroke which really caused the defeat of the "Folding Box" foursome.

Another match was played between a Piermont foursome and a New York office foursome. The Piermont foursome consisting of Messrs. Moore, Komornick, Grull and Moth showed too much golf for the New York office foursome, made up of Messrs. Smith, England, Fast and Chisholm.

Other prize winners were the following: Clifford Moth, Joseph Hanousek, E. H. Moore, John Pabst, Joseph Grull and Fred Coursen of the Piermont plant; Bob Ross of the Eastern States Carton Division; Floyd C. Costello of the Bogota plant; T. G. Morison and Frank Newton of the Boston office; Walter Ringle, William Boyle, E. Meyer, H. Whitmore, S. R. Cahoon, Ed Ege and C. R. Bradley of the New York office.

H. M. Carpenter of the New York office also took a prize in the "Non-Players' Handicap."

All prizes were donated by employees of the company and Mr. George E. Dyke, president of the company, contributed the lunch for the entire party.

Others not mentioned who also attended were Messrs. Greenway, vice president and general manager, Sommer, Callaghan, Israel, Van Decker, Curtis, Shannon, Peterson, Kyle, Morris, Woerner, Bauser, Duer, Rogers, Tietgen, Evans, Griesel, Malcolmson, de Clercq, Seaver, Barr, Connolly, Millar, Stiegler, Moss, Olsen, Euble, Trimble, Gettinger, F. Smith, Burke and Weiss.

Forest Industries Conference Announced

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., October 11, 1939—The Forest Industries Conference, a new departure in the relation of industry and government, has been announced as a functioning body after several months of formulative work. The conference met at the invitation of Secretary Henry A. Wallace, in line with a plan developed by the Secretaries of Interior, Agriculture, and Commerce.

Following is the Conference's statement: "Composed of forestry and other officials of several Government agencies and representatives of industry, the Forest Industries Conference has for its basic purpose correlated assistance in the sound economic development of forest products industries through two major approaches:

"First, to eliminate duplication of effort on the part of Government agencies concerned with forestry and its related industries; second, to furnish the industries an opportunity to present their viewpoints, both as they involve the development of industry and its relation to forestry and as they involve the Governmental action in related fields. The Conference proposes to attain these objectives through the use of discussion methods at a series of monthly meetings in which Government officials and representatives of the industry will take part. The Conference will not attempt to establish policies, will act as a clearing house for information and as an advisory body in the development of harmonized public and industrial thinking.

"In so far as is known, the Forest Industries Conference is the first attempt at interdepartmental and inter-industry cooperation in those fields. Progress made thus far, however, indicates clearly the value of the Conference and it is felt that the underlying principle of the conference might be applied to other basic industries as well as forestry.

"A committee to direct the activities of the Conference includes Dr. Wilson Compton, Henry Bahr and W. R. Burt of the National Lumber Manufacturers Association; H. M. Brinckerhoff of the American Pulpwood Association; Charles W. Boyce of the American Paper and Pulp Association; Lee Much and L. D. Arnold of the Department of the Interior; E. W. Tinker, G. D. Cook and C. Stowell Smith of the Department of Agriculture; Ernest A. Tupper and Phillips A. Hayward of the Department of Commerce; and George M. Putnam and W. R. Ogg of the American Farm Bureau Federation."

Government Paper Bids

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., October 11, 1939—The Government Printing Office has received the following bids for 40,000 pounds of newsprint paper in 36 inch rolls: Paper Corporation of U. S., 3 cents; and Stanford Paper Company, 2.8 cents.

For 5,000 sheets of 24 x 36 brown cloth lined cover paper: Mudge Paper Company, $116.15 per M sheets; Stanford Paper Company, $120.00; Whitaker Paper Company, $115.89; Mathers-Lamm Paper Company, $126.95; Middlesex Products Company, $123.50 less 2 per cent; Virginia Paper Company, $116.50; Nashua Gummed & Coated Paper Company, $133.50 less 2 per cent; Old Dominion Paper Company, $119.99; and Barton, Duer & Koch Paper Company, $116.45.

COMPLETE MILL ALTERATIONS

(Continued from page 13)

Wisconsin Public Service Commission at Madison, Wis., October 10. The hearing is in the case of the Wisconsin Paper and Pulp Manufacturers Traffic Association versus the Ahnapee and Western Railroad Company and other railroads.

To Reforest Part of 65,000 Barren Acres

Three million seedlings are being distributed this fall by the federal nursery at Rhinelander, Wis., to reforest a portion of 65,000 barren acres in the Nicolet National Forest in northern Wisconsin. The plantings will be mostly white, red and jack pine and spruce. Replanting has been carried on for the last five years, and 76 per cent of the seedlings have survived and are thriving. This record has been maintained despite adverse weather conditions, and destruction by fire and rodents. The vast plantings will help to augment the pulp wood supply in Wisconsin in years to come.

Dams on Peshtigo River Under Repair

Repair work is being completed by C. R. Meyer & Sons Company, Oshkosh, Wis., on two dams of the Wisconsin Public Service Corporation on the Peshtigo River. A new apron of concrete 18 feet across and ten feet deep has been built on the dam at Peshtigo, Wis. Two aprons have also been resurfaced at the Potato Rapids dam. The work has been in progress for about six weeks.

Hourly Wage on Government Work 39 Cents

Wisconsin paper mills working on government contracts will be required to pay a minimum wage of 39 cents per hour, according to notice received from Secretary of Labor Perkins at Washington. The minimum established by the Board of Public Contracts formerly was 40 cents per hour. This schedule will apply to all states of the middlewest and north.

Boston Paper Men Meet

[FROM OUR REGULAR CORRESPONDENT]

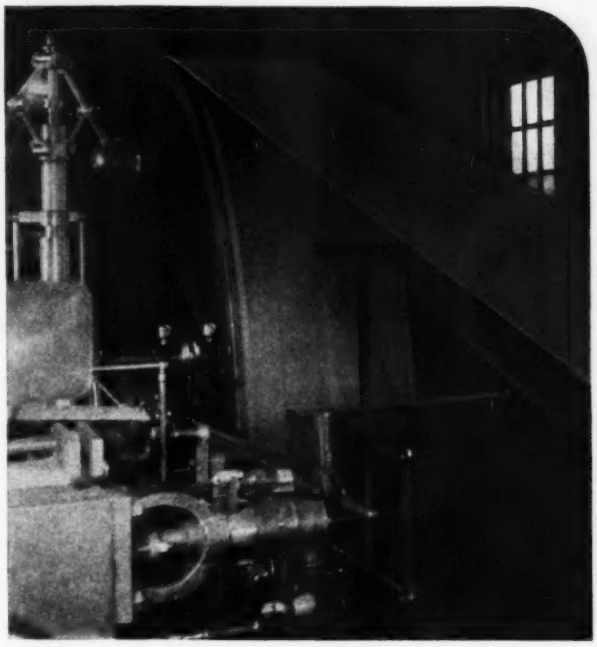
BOSTON, Mass., October 9, 1939—A well attended luncheon meeting of the Fine Paper Division of the New England Paper Merchants Association was held Thursday at the Boston Chamber of Commerce, at which matters of current interest to the trade were discussed. Frederic G. Lockwood, vice-president of the Association in charge of the Fine Paper Division, was in the chair.

A luncheon meeting of the Wrapping Paper Division of the New England Paper Merchants Association took place at the Boston Chamber of Commerce Thursday. Subjects of importance to the trade were considered. John F. Blackman, vice-president of the Association in charge of the Wrapping Paper Division, presided.

Elmer Z. Lane Dead

Elmer Z. Lane, for many years purchasing agent for the Waterfalls Paper Mills, Mechanic Falls, Me., died at his home in that place on September 30, after suffering a stroke. He was 64 years old.

Mr. Lane was active in church and civic affairs. The funeral was held at the family home.



Here's the CURE for BELT KILLING DRIVES

Paper mills everywhere have found that Cincinnati Belts are the cure for tough . . . belt wearing . . . killing drives.

The paper mill using the belt illustrated above has more than half a mile of Cincinnati Transmission Belting in service . . . in another, more than 110 drives are "Cincinnati" controlled . . . while many mills are 100% "Cincinnati" equipped. In short, more paper mills are using Cincinnati Belts today than ever before . . . there's a reason for that kind of buying.

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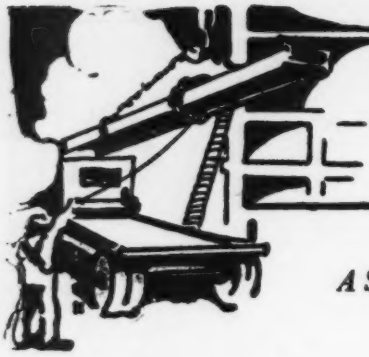

CONSTRUCTION NEWS

A Summary of Vital Facts Regarding Construction, Financing and Operation of Pulp and Paper Mills

General Construction News

Everett, Wash.—The Soundview Pulp Company, manufacturer of bleached sulphite pulp, has approved plans for new one-story addition to mill, 25 x 112 feet, including installation of six new concrete tanks, each 18 x 32 feet, for bleach service. Entire project is estimated to cost over $60,000. General contract has been let to the Austin Company, 16112 Euclid avenue, Cleveland, Ohio, and Dexter-Horton Building, Seattle, Wash., and work will be placed under way at once.

Indianapolis, Ind.—The Indianapolis Paper Container Company, 217 West 10th street, manufacturer of paper boxes and containers, has completed plans for one-story addition, 31 x 118 feet, to be used for storage and distributing service. It is estimated to cost about $35,000, with equipment. General erection contract has been let to the A. V. Stackhouse Company, 635 North Pennsylvania street, and erection will proceed at early date.

Neenah, Wis.—The Bergstrom Paper Company, manufacturer of book and kindred paper stocks, has awarded general contract to the Fluor Brothers Construction Company, 48 Otter street, Oshkosh, Wis., for one and two-story addition, 30 x 56 feet, to clarifier building at mill, reported to cost over $45,000, with equipment. Work is scheduled to be placed under way at once. An award for roofing has been made to the E. D. Chase Company, Oshkosh, and other contracts for finishing work will be made soon.

Stockton, Calif.—The Fibreboard Products, Inc., Russ Building, San Francisco, Calif., manufacturer of paper board and straw board products, etc., has awarded general contract to Barrett & Hilp, 918 Harrison street, San Francisco, for new addition to branch mill at Stockton, recently referred to in these columns, and will place superstructure under way at once. It will be one-story, reported to cost about $50,000, with equipment. Leland S. Rosener, 233 Sansome street, San Francisco, is engineer.

Watervliet, N. Y.—The Behr-Manning Company, Sidford street, Troy, N. Y., manufacturer of abrasive papers and kindred materials, has approved plans for new addition to mill on Tenth Avenue, Watervliet, to be one-story, 125 x 400 feet, designed primarily for storage and distributing service. Cost estimated over $75,000, with equipment. General erection contract has been let to the Morton C. Tuttle Company, Park Square Building, Boston, Mass., and work will be placed under way at once. Company is a subsidiary of the Norton Company, Worcester, Mass.

Akron, Ohio—The Rohner Paper Company, 763 South High street, commercial paper products, plans rebuilding of portion of storage and distributing plant recently destroyed by fire. Loss reported close to $100,000, including equipment.

Milltown, N. J.—John F. Burns, Jr., and associates have leased a portion of former local mill of the Michelin Tire Company, totaling about 5000 square feet of floor area, and will modernize and equip at once for new plant for the manufacture of wallpaper. It is expected to begin production at early date.

Portland, Ore.—The Crown Zellerbach Corporation, Fifth avenue and N. W. Everett street, manufacturer of paper products, has superstructure under way for new two-story addition to local storage and distributing plant, recently noted in these columns, to be 90 x 100 feet, with foundations for a third floor at later date. Miscellaneous contracts are being awarded for work, including iron work to the City Iron Works, 723 North Tillamook street; millwork to Nicholai-Neppach Company, 117 N. W. Davis street; and for plumbing and heating to A. G. Rushlight & Company, 407 S. E. Morrison street, all of Portland. General contract will be carried out by Reimers & Jolivette, Inc., Railway Exchange Building, Portland, and will include certain modernization and improvements in existing multi-story building. Cost reported close to $125,000, with equipment. O. R. Johnson is resident engineer for company, in charge. Main offices are at 343 Sansome street, San Francisco, Calif.

Akron, Ohio—The Minnesota Mining and Manufacturing Company, Forest street, St. Paul, Minn., manufacturer of abrasive papers, sand paper and kindred materials, has plans under way for new addition to branch plant on Copley road, Akron, estimated to cost about $70,000, with equipment. It is expected to begin work before the close of the year.

Atlanta, Ga.—The National Paper Company, 334 Simpson street, manufacturer of paper tubes and other paper goods, has approved plans for new one-story addition to plant on site on Bolton street, reported to cost close to $40,000, with equipment. General erection contract has been awarded to W. P. Francis, 201½ Luckie street, N. W., and superstructure will be placed under way at once.

New York, N. Y.—S. Rappaport, Inc., 516 West 34th street, manufacturer of folding paper boxes and containers, has leased additional space in building at location noted, known as the Heywood-Wakefield Building, totaling about 20,000 square feet of floor area, and will equip for expansion.

Fitchburg, Mass.—The Louis Dejonge Company, manufacturer of coated book and other paper stocks, has completed plans for new addition to local mill on Oak Hill avenue, comprising a second story extension to present one-story mill building, reported

to cost about $50,000, including equipment. Contract for erection has been awarded to the B. A. Wade Company, 336 Main street, Fitchburg, and work will proceed at once.

Munroe, Mich.—The Consolidated Paper Company, manufacturer of container board, straw board and other paper board products, has advanced production to capacity schedule and is now operating on a 24-hour basis, seven days per week. It is proposed to hold to this basis for an indefinite period.

Sturegeon Falls, Ont.—Abitibi Power and Paper Company, Ltd., Toronto, Ont., is said to be considering remodeling and improving mill at Sturgeon Falls for sulphite pulp manufacture, with installation of additional equipment. Cost is reported at close to $100,000. The plant has been closed for a number of months.

TAPPI Notes

The Pacific Section of the Technical Association of the Pulp and Paper Industry will meet at Camas, Wash., on Tuesday, November 7, 1939.

All who may be interested are invited to attend the ceremony of the cornerstone laying at the site of the Regional Research Laboratory of the U. S. Department of Agriculture just outside of Philadelphia, Pa., on Friday, October 20, 1939. The speakers will be Senator Guffey of Pennsylvania and Under-Secretary of Agriculture, M. L. Wilson.

The Symposium on Color Tolerance, a report of the 1939 technical session of the Inter-Society Color Council, of which TAPPI is a member, is now available and may be obtained for fifty cents per copy from the Council, P. O. Box 155, Banjamin Franklin Station, Washington, D. C. This booklet includes "Specification of Color Tolerances at the National Bureau of Standards", "The Psycho-physics of Color Tolerance", "Representation of Color Tolerance on the Chromaticity Diagram", "The Ratio Method in The Review of The Munsell Colors" and "Color Tolerances as Affected by Changes in Composition and Intensity of Illumination and Reflectance of Background".

The Executive Committee of the Delaware Valley Section of the Technical Association met at the Engineers Club, Philadelphia, on Wednesday evening, October 4, 1939. Those present were C. M. Connor, J. R. Atwater, C. W. Hoffman, F. W. Brainerd, Geo. Schwartz, W. M. Schoemaker, J. D. Davis, E. J. Albert, Chas. Shubert and R. G. Macdonald. Program plans for the monthly meetings were discussed. The speaker for the October 13th meeting will be J. R. Sanborn of the New York Agricultural Experiment Station, Geneva, N. Y., on "Bacteriological Control of Paper".

To Represent Sandy Hill Works

E. C. Jacobi, who is well known to executives of the pulp and paper industry, has been appointed as an assistant to J. W. Joslyn, staff engineer of the Sandy Hill Iron and Brass Works, Hudson Falls. Mr. Jacobi will act as sales representative for the company on paper and pulp machinery in Minnesota, Wisconsin, Michigan, Illinois, Indiana and part of Ohio. In addition to this new connection, Mr. Jacobi will continue as sales representative for Lodding Doctors and Broughton Systems.

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COMING EVENTS IN PAPER INDUSTRY

NEW ENGLAND SECTION. Technical Association of the Pulp and Paper Industry—Third Friday of each month at the Roger Smith Hotel, Holyoke, Mass.

DELAWARE VALLEY SECTION. Technical Association of the Pulp and Paper Industry—Second Friday of each month at the Engineers Club, Philadelphia, Pa.

LAKE STATES SECTION. Technical Association of the Pulp and Paper Industry—Second Tuesday of each month at the Conway Hotel, Appleton, Wis.

KALAMAZOO VALLEY SECTION. Technical Association of the Pulp and Paper Industry—First Thursday of each month at the Park American Hotel, Kalamazoo, Mich.

NATIONAL SAFETY COUNCIL, PAPER AND PULP SECTION, Annual Meeting, Atlantic City, N. J. October 16-20.

BUSINESS RECOVERY

Steadily the volume of business activity expands with substantial improvement in sales reported from practically all large commercial districts. The index of business activity for the last week in September was 102 per cent. How substantial has been the gain in business recovery this year is apparent when the present is compared with the same period last year when the index was 81 per cent. According to the Department of Commerce business recovery which began in May increased at an accelerated rate during September, with major increases reported in production and employment. The spurt last month, the department said, resulted from speculative accumulation of stocks of raw commodities and manufactured products in anticipation of increases in prices. Consumers' incomes were increased last month by the resultant rise in payrolls and by higher farm prices.

"Most spectacular among the immediate reactions to the hostilities in Europe," the department report continued, "was the upward spurt in prices of basic commodities. Heavy buying took place in anticipation of rising prices and possible difficulties in securing deliveries, with a resultant sharp advance in the rate of business improvement that had been under way during the summer. While forward purchases were more aggressive in basic commodities, semi-finished and finished goods were also shortly the object of heavy buying. Under the impetus of a buying wave in organized commodity markets of extreme proportions, prices responded sharply and rapidly.

"Professional traders, the public and manufacturers alike, participated in the purchasing. The advance during the first week of hostilities was probably of record size for so short a period of time. However, after the very active buying in the early weeks of September there was a falling off in the latter part of that month. Unfilled orders at the end of the month, nevertheless, were exceptionally large in numerous instances."

In commenting on advances made in inventories, the department said in part: "The rapid rise in production and the increased movement of goods into trade channels led to substantial increases in inventories of business concerns. Extension of the current industrial advance after the existing backlogs of orders are reduced to more usual proportions will depend on developments of new dynamic demand factors, such as heavier exports or a pick-up in business expenditures for durable products. The role of capital formation in expanding or even maintaining the current business advance has become of increasing importance, while the immediate prospect for a vigorous growth in export trade was not clear on the basis of September events.

"Manufacturing operations at the end of September were far ahead of the level at the close of August. Output was the largest for any month since September 1937. The rise in factory output was most prompt in basic semi-manufactures, but by the end of the month operations were being speeded up over a wide range of industries producing both partly processed and highly fabricated products."

From the reports issued by authoritative sources the present activity is based largely on buying for inventory and it is pointed out that business will face a severe setback in the first half of 1940 unless soon supported by European buying and by increased domestic orders for plant and equipment. A protracted period of relative inaction in hostilities in Europe is believed of little support to our industries. Support may come, it is generally agreed by economists and business leaders, from increased expenditures of our own armament, from railroad purchasing, from some plant expansion and from continued heavy government expenditures that will rise as WPA entrollment is raised during the winter months.

Owing to the risks of shipping goods to Europe in American ships, the expansion of our trade with countries in Central and South America, has been advocated. Unfortunately trading with Latin American countries is quite different from selling goods in the home market. At present the United States has about 25 per cent of South America's trade but unless this country takes more South American goods it may be difficult to develop this trade to an important volume. Hostilities in Europe have disrupted South American exports, which are chiefly raw materials and in part compete with those of this country. Reduction of raw materials to Europe must mean reduced supplies of foreign exchange and a curtailment of South American purchasing power for any and all foreign products. The prospect of developing trade with South America; a continent rich in resources, partly

undeveloped, of those materials which this country must import, is an attractive one. There are several important problems for businessmen in this country to solve if this trade is to be a profitable one.

One of the important factors in developing trade in South America is the investment of American capital. United States investors have at the present time approximately $3,000,000,000 invested in South America, a large part of which is in default. In addition to this considerable investment, there is $2,000,000,000 invested in Mexico, the Gulf and the Caribbean, which with $3,750,000,000 invested in Canada, aggregates $8,750,000,000 out of a total of $15,000,000,000 private foreign investments of the United States. We have $4,500,000,000 invested in Europe. With more favorable political conditions, larger amounts of capital could be employed in South America. But the labor problem is also a difficulty. Although South America has more than double the area of this country, it has only 88,000,000 population, a large proportion of which is Indian. Many of the essential commodities which could be produced in South America are now manufactured in the Orient, where there is an abundance of labor available at very low wages.

But these difficulties are capable of solution. The result of the meeting of the 1,200 delegates, representing every branch of international commerce, which took place on October 9 in New York in the twenty-sixth annual national foreign trade convention sponsored by the National Foreign Trade Council, may be the formulation of some practical program for improving the trade relations of the United States with the rest of the Americas.

Herty Forest Institute Formed

WAYCROSS, Ga., October 9, 1939—Establishment of the Herty Forest Institute, with headquarters in Waycross, a geographic center of the slash pine area which the late Dr. Charles H. Herty made famous through his experiments at the Herty Foundation pulp and paper laboratories in Savannah, is announced by the Slash Pine Forestry Association.

George M. Bazemore is president, and J. S. Elkins is secretary of the association.

The Herty Forest Institute, with a permanent headquarters building in Waycross, will serve as "the Southern pine territory's memorial to Dr. Charles H. Herty, a great American and Georgian whose achievements for his native Southland are fast transforming it into a new country of prosperity", comments Mr. Elkins in outlining the objectives of the institute.

The institute will maintain a forestry museum where exhibits of raw material from the pine forests, and manufactured products from these materials, will be displayed to show the value and vastness of the natural forest resources. The museum also will contain works of art, particularly photographic pictures of forests and forestry.

A forestry library with a complete assortment of forest literature, will be made available to the public. Text books on all phases of forestry, and various types of forestry literature, will be presented.

Production Ratio Report

These statistics are based upon paper production reports to the American Paper and Pulp Association.

COMPARATIVE MONTHLY SUMMARIES[1]

Months	1939	1938	1937	1936	1935	1934
January	77.5%	63.9%	90.3%	76.1%	65.8%	.....
February	81.7%	68.7%	90.1%	77.9%	70.0%	.....
March	84.0%	69.6%	90.3%	76.0%	70.5%	.....
April	82.9%	68.3%	92.1%	82.3%	70.0%	.....
May	80.2%	69.0%	90.6%	81.6%	69.4%	.....
June	79.7%	66.0%	87.3%	80.7%	72.3%	.....
July	75.2%	72.0%	81.8%	77.3%	64.9%	.....
August	82.9%	77.2%	82.9%	81.5%	70.9%	.....
September	87.9%	76.3%	78.6%	80.5%	71.9%	58.2%
October	.....	82.5%	73.5%	87.6%	75.6%	64.7%
November	.....	79.6%	61.9%	88.0%	75.3%	61.7%
December	.....	74.4%	54.5%	85.9%	71.2%	59.6%
Year Average	.....	72.3%	80.6%	81.3%	70.5%	.....
First 39 weeks	81.4%	70.1%	86.9%	79.4%	69.4%	.....

COMPARATIVE WEEKLY SUMMARIES[1]

CURRENT WEEKS, 1939		CORRESPONDING WEEKS, 1938	
August 26	83.3%	August 27	80.1%
September 2	85.1%	September 3	77.5%
September 9	74.2%	September 10	66.0%
September 16	91.9%	September 17	79.6%
September 23	93.5%	September 24	78.4%
September 30	94.6%	October 1	81.1%

The following statistics show the number of mills reporting by ratio groups:

	Number of Mills Reporting—Current Weeks					
Ratio Limits	Aug. 26, 1939	Sept. 2, 1939	Sept. 9, 1939	Sept. 16, 1939	Sept. 23, 1939	Sept. 30, 1939
0% to 50%	70	60	59	45	31	29
51% to 100%	235	245	240	254	248	172
Total Mills Reporting	305	305	299	299	279	201

PAPERBOARD OPERATING RATIOS

Per cents of operation based on "Inch-Hours" reported to the National Paperboard Assn.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July
1935	62%	68%	68%	63%	61%	66%	62%
1936	62%	67%	67%	70%	69%	70%	69%
1937	80%	86%	86%	88%	85%	77%	66%
1938	54%	60%	61%	57%	58%	56%	57%
1939	60%	67%	71%	69%	64%	67%	63%

Year	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1935	67%	71%	77%	71%	61%	66%
1936	75%	78%	82%	80%	74%	72%
1937	74%	69%	65%	55%	45%	73%
1938	66%	66%	70%	65%	59%	61%
1939	72%	....	....	....	....	....

Week end. Aug. 26, 1939—72%
Week end. Sept. 2, 1939—73%
Week end. Sept. 9, 1939—63%
Week end. Sept. 16, 1939—79%
Week end. Sept. 23, 1939—80%
Week end. Sept. 30, 1939—82%

[1] Production-capacity ratios are based upon six-day capacity ratings which are adjusted periodically to correspond with the ratings reported by individual companies. Ratios are subject to revision until all reports are received.

Italy Limits Pulp Consumption

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., October 11, 1939—In an effort to limit the consumption of wood pulp, the Italian Government has limited daily newspaper editions to four pages, according to a report from the American Commercial Attache at Rome, made public by the Department of Commerce.

The decree by which the limitation was established pointed out that for the first six months of 1939, Italy's imports of mechanical wood pulp for paper manufacture totaled 12,995 quintals and imports of chemical wood pulp for purposes other than the fabrication of artificial textile fibers totaled 631,529 quintals.

The total domestic production during the same period amounted to 765,590 quintals of mechanical wood pulp and 252,380 quintals of chemical wood pulp.

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Section of the
Technical Association of the Pulp and Paper Industry

Edited by Ronald G. Macdonald, Secretary

Review Of Paper Industry Literature

Abstracts Compiled By the Abstracts and Bibliography Committee of the Technical Association of the Pulp and Paper Industry, A. Papineau-Couture, John F. Ohlson, C. E. Peterson and Clarence J. West, Chairman.

Copies of United States Patents can be obtained from the United States Patent Office, Washington, D. C. for 10 cents each. Send currency, not stamps.

Paper Specialties

Method of Coagulating Rubber Upon Fibers. Harold W. Grieder and Marion F. Smith, assignors to The Philip Carey Manufacturing Company. U. S. pat. 2,133,693 (Oct. 18, 1938).—An emulsion of a waterproofing material such as rubber is prepared at a temperature above the melting-point of the water-proofing material and is added to an aqueous suspension of asbestos fiber at a temperature below the melting-point of the waterproofing material. The pulp is then diluted with water to coagulate the rubber and precipitate it on the asbestos fibers. (Cl. 92-21).—A.P.-C.

Process and Apparatus for the Longitudinal Creping of Webs of Paper. Rudolf Haas, assignor of one-half to Zellstofffabrik Walhof. U. S. pat. 2,130,007 (Sept. 13, 1938).—The web is passed over a body having a curved portion which corresponds to part at least of the curved surface of a roll having a stationary curved axis, and in a direction from the convex toward the concave part of the surface. The web is pressed against this surface while passing over it by means of compressed air or of vacuum, the formation of the crepe creases being at the same time initiated and continuously assisted. (Cl. 154-30).—A.P.-C.

Laminated Trimming Strip and Method for Making Same. Glen H. Huffer, assignor to Backstay Welt Company. U. S. pat. 2,119,482 (May 31, 1938).—A compact, contoured, laminated body of strip form is composed of a number of groups of plies. Each group consists successively of crepe paper, relatively inelastic asphaltic adhesive, another layer of crepe paper, and an exceedingly thin film of elastic adhesive, assembled compactly in the above order. The crepings of the paper extend transversely of the body and the elastic adhesive lies substantially wholly on the surface of the paper of adjacent groups without penetrating the paper more than microscopically. (Cl. 154-2). —A.P.-C.

Process of Producing Pigmented Paper and Impregnating It with a Resinous Binder, and Product Obtained Thereby. Gerald H. Mains, assignor to Westinghouse Electric and Manufacturing Company. U. S. pat. 2,125,076 (July 26, 1938).—A number of sheets of fabric or paper are impregnated with a phenolic, urea or other resin that may be readily molded, and are superimposed on one another to form a body stack of the desired size. A surface sheet is applied which comprises a suitable amount (usually 10% to 20%) of a white or colored pigment and which is impregnated with a suitable moldable resin. The assembly is then pressed into a unitary mass. (Cl. 154-2).—A.P.-C.

Paper Towel. Samuel F. Atkins, assignor to the Northwest Paper Company. U. S. pat 2,130,375 (Sept. 20, 1938).—Tongue- or V-shaped tears are formed in paper towelling so as to expose many fibers and fiber ends individually thus increasing the absorbency of the sheet. The tears are arranged with respect to the direction of rolling so as not to weaken the paper or subject it to undesired tearing. (Cl. 92-68).—A.P.-C.

Coated Abrasive Article and Method of Making the Same. Norman P. Robie, assignor to The Carborundum Company. U. S. pat. 2,128,966 (Sept. 6, 1938).—A mixture of abrasive grains and a pulverized binder is applied to a backing which has been treated so as to cause the mixture to become attached to the backing. The coated product is then treated to cause the binder to adhere to both the grains and the backing. Where a heat hardenable resin, such as a phenolic condensation product, is used as the binder, the coated product may be heated to harden the resin. (Cl. 51-278). —A.P.-C.

Abrasive Coated Material. Raymond C. Benner and Romie L. Melton, assignors to The Carborundum Company. U. S. pats. 2,128,905 to 2,128,907 (Sept. 6, 1938).—**No. 2,128,905**—A thin layer of abrasive grains is attached to a backing by a base coating of liquid adhesive. A sizing coating of dry powdered adhesive is applied and the coated product is treated to cause the dry powdered sizing coating to become attached to the abrasive grains and to unite with the base coating of liquid adhesive. **No. 2,128,906**—There is applied to a rapidly moving web backing material a layer of liquid resinous adhesive that remains fluid until

heated to cause it to set. A layer of abrasive particles is applied over the surface of the adhesive. The coated web is maintained in a substantially horizontal position during the heat treatment required to set the adhesive. **No. 2,128,907**—A base coating of wet adhesive is applied to a moving web. The latter is supported with the adhesive-coated surface downward and elongated abrasive granules are projected against the web and oriented so as to hang downwards. The web is moved into an electrostatic field where powdered adhesive material is projected electrostatically on to the web. The latter is then subjected to appropriate heat treatment to cure both the wet and the dry adhesive simultaneously. (Cl. 51-278; 91-70; 51-278).—A.P.-C.

Paper Propagating Pot. Martin Leatherman, dedicated to the free use of the People of the United States. U. S. pat. 2,129,190 (Sept. 6, 1938). —Paper pots used for propagating plant seedlings are impregnated with copper resinate. (Cl. 47-37). —A.P.-C.

Paper Manufacture. Alexander J. Auchterlonie. Fr. pat. 823,582 (Jan. 22, 1938).—The nonfibrous part of annual plants is treated with a light soda liquor to extract the gummy and ligneous substances while preserving unaltered the natural absorption properties of the cells of the material. The residue is treated with a bleaching agent such as sodium or calcium hypochlorite. The material is washed, passed onto a screen and dried to form a coherent, very absorbent sheet of paper. The paper is impregnated with a resin and several sheets are heated together to form a block with properties similar to those of the resin used. The cellulose may also be used for making a nitrate or acetate.—A.P.-C.

Machines for Making Pulp Boards. Orland R. Sweeney. Brit. pat. 480,224 (Feb. 18, 1938).—Machines in which the pulp is formed into a continuous sheet, cut into lengths, transferred to a loading rack by a tipping conveyor and then to a press in which the sheets are pressed and dried, comprise a loading rack provided with a series of conveyors and a press having a series of platens and a conveyor for each platen, means for operating the conveyors of the rack and press being interrelated so that the opening of the press causes the boards automatically to be discharged from the rack into the press.—A.P.-C.

The Permutit Co. Joins TAPPI

The most recent addition to the membership of The Technical Association of the Pulp and Paper Industry is The Permutit Company of 330 West 42nd street, New York, N. Y., which is the world's largest manufacturer of water conditioning equipment, was organized in 1913 and at that time acquired patent rights for the newly discovered zeolite water softening industry. Since that time, its facilities for designing and manufacturing water conditioning equipment of all types have been greatly expanded through research, and today Permutit offers equipment which will practically tailor-make any fresh water, irrespective of its source, for any desired use. Among recent processes developed by Permutit is Zeo-Karb—a new hydrogen, non-siliceous zeolite which completely removes bicarbonates, as well as hardness, from water by ion exchange—and the Spaulding Precipitator, a basically new development in cold lime treatment wherein less space is needed, less chemicals are employed, and clearer effluent is produced, resulting in saving in plant design and a decrease in the frequency of filter washings.

The personnel of the Permutit Company is as follows: W. Spencer Robertson, president; S. B. Applebaum, vice-president and secretary; H. W. Foulds, vice-president; H. L. Tiger, vice-president; D. J. Saunders, manager of industrial sales. The Permutit Company is represented in the United States by approximately twenty-five of its own sales offices, staffed by its own sales engineers, and Permutit equipment is sold throughout the world through associated companies and other distributors.

Recent Changes in the Patent Laws*

During its last regular session, the Congress of the United States on the recommendation of the Commissioner of Patents and the Temporary National Economic Committee made the following changes in the Patent Law:

1. Effective August 5, 1940, the period within which an inventor may make public use or sale of the device of his invention before filing his patent application has been reduced from two years to one year. The inventor must also file his application not later than one year after the invention is described in a printed publication.

2. Effective October 5, 1939, the right of appeal of the losing party in a patent interference to the Board of Appeals has been abolished. In all patent interferences declared after that date, the hearing will be held before a Board of Interference Examiners consisting of three examiners, and the losing party will have the right to appeal directly to a Court, instead of to the Board of Appeals and then to the court as under the present practice.

3. Effective August 5, 1940, applicants for patent wishing to contest the question of priority of invention with an issued patent will have only one year instead of two years to copy the claims of the issued patent.

4. Effective August 7, 1939, the Commissioner of Patents is authorized to require an applicant for patent to respond to an Office Action within six months *or such shorter time, not less than thirty days, or any extension thereof, as may be fixed by the Commissioner in writing to the applicant.*

5. Effective August 9, 1939, the right of an applicant for patent to forfeit and then to renew an allowed application has been abolished. Instead an applicant must pay the final fee within six months after the application has been allowed. However, the Commissioner is authorized to accept the final fee in his discretion, if it is tendered within one year after the six months period for payment has elapsed. The delayed fee must be accompanied by a petition and an additional fee of $10.

Two additional proposals of the Commissioner and the Temporary National Economic Committee failed of enactment. One of the unsuccessful proposals was the provision for a single court of patent appeals, and the other was an act limiting the term of a patent to no more than twenty years from the filing date.

* Bulletin of the Patents Committee of the Technical Association of the Pulp and Paper Industry, C. W. Rivise, Chairman.

The Effect of Particle Size on the Efficiency Of a Rosin Suspension As Measured by the Retention of Rosin and the Degree Of Sizing Imparted to Paper*

By Firth Dennett[1] and C. E. Libby[2]

Abstract

A suitable procedure for the evaluation of a rosin size was developed.

Using this procedure the sizing ability of several suspensions of pure abietic acid in gelatin solution were investigated. Suspensions were made with average particle size, as determined by the ultramicroscope, varying from 226 to 688 millimicrons radius.

It was shown that suspensions with an average particle size above 350 millimicrons radius gave lower sizing values, the sizing value decreasing sharply as the upper range of the investigation was reached. From these results it was concluded therefore, irrespective of the manner in which the rosin was held to the fiber, that the particle size of free rosin had a definite effect upon the sizing value of high free rosin sizes.

"H" grade rosin suspended in gelatin in the same manner as the abietic acid was found to have 83 per cent of the sizing efficiency of an abietic acid suspension of the same particle size utilized under the same conditions.

A sample of high free rosin size, containing 80 per cent free rosin, showed about 88 per cent of the sizing efficiency of an abietic acid suspension having approximately the same size of free rosin particle.

A nearly neutral size gave values 49 per cent as high as the abietic acid-gelatin suspension.

Since the introduction of rosin sizing by Illig in 1807 many theories have been developed to explain the process; but due to the large number of variables involved, and the lack of a standard procedure for the evaluation of a rosin size, no explanation has been entirely satisfactory. Early theories considered definite chemical reactions taking place in the beater and ascribed the results to the compound aluminum resinate. In recent years much has been written about the electrostatic theory which maintains that free rosin is the sizing medium. The present paper deals with the development of a suitable sizing procedure, and the determination of the effect of the dimension of the free rosin particles on the degree of sizing.

Lorenz *(5)* was the first to study in detail the colloidal aspects of sizing. According to his electrostatic theory of the sizing mechanism, the aluminum hydroxide, formed by the hydrolysis of alum, is held to the negative fiber by capillary forces and by colloidal adsorption. With the adsorption of the alumina the fibers became positive in charge, and the negative rosin particle is held to them. Sieber *(10)* studied the sizing mechanism in much the same manner as Lorenz. He concluded that free rosin separates from the sodium resinate in contact with the pulp fibers due to the fact that cellulose acts as a semi-permeable membrane, allowing the inorganic ions to pass, resulting in a complete dissociation of the solution; the film of rosin particles gradually precipitating on the fibers. A recent investigation by Robinson *(8)* showed that the hydrolysis of the size solution induced by the pulp fibers is as high as 44 per cent in the case of unbleached kraft.

Strachan *(12)* stated that the covering power of the rosin depended upon the specific surface and the particle size, no matter how the rosin was held to the fiber. Weiger *(13)* reported that the molecular and also the colloidal states were of prime importance to the sizing effect, while the coarsely dispersed state was of no importance whatsoever. Lee *(4)* concluded from his microscopical investigations that poor sizing was apparently due to the presence of numerous large homogeneous masses instead of the finer particles. Oman *(6)* found that the completeness of the layer of rosin on the fiber was dependent upon the degree of dispersion of the rosin. He believed that the rosin varied in degree of negative charge due to its particle size. According to him, fixation of the rosin upon the fiber was dependent partly upon the degree of dispersion of the rosin, and partly upon the charge on the fiber and the rosin. Rowland *(9)* stated in discussing the colloidal properties of cellulose, that materials were retained in the paper either through the process of surface adsorption, involving surface energy and electrostatics, or through mechanical filtration. Kanomaru *(2)* found that the best sizing resulted when sufficient quantities of rosin and alum were added so that the negative charge of the fiber just corresponded to the positive charge of the coagulation product consisting of aluminum hydroxide and rosin particles. This was the condition which resulted when the isoelectric point of the mixture was reached.

Experimental Part

The results obtained in this problem may be roughly divided into four sections; (1) preparation of materials and size suspensions; (2) development of sizing and drying procedure; (3) sizing with suspensions

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of abietic acid of varying particle size; (4) sizing with commercial sizes.

Preparation of Materials

In order to insure the possibility of reproducing results, and to eliminate as many of the variables as possible, pure abietic acid, high grade alpha pulp, C. P. aluminum sulphate, and distilled water were used throughout the work except in the development of the procedure and in a few runs made with commercial materials.

The pulp used was Solka No. 1 soft Alpha, obtained from the Brown Company, Berlin, New Hampshire. This pulp as received had the following analysis:

Resin content	0.13 per cent
Ash content	0.12 per cent
Caustic solubility (1 per cent)	2.03 per cent
Copper number	0.41 per cent
Alpha cellulose	93.6 per cent

The abietic acid was prepared in the same manner as that employed by Steele *(11)* in making the pure crystals from "WW" grade rosin. The rosin was heated under reflux with glacial acetic acid, allowed to crystallize, washed and then re-crystallized from alcohol until the acid number approached the theoretical. (i.e. 185.6.)

Several methods were tried in preparing suspensions of abietic acid of varying particle size. An attempt was first made to prepare a suspension by dissolving the acid in alcohol and dropping the solution into water but large crystals formed in the suspension upon standing for a short while. Acetone and ammonium hydroxide were employed in much the same manner with unsatisfactory results. Suspensions were next prepared with the aid of a colloidal mill and a suspending medium such as starch, egg albumen, agar, gelatin, sodium hydroxide, and a triethanolamine soap. The most satisfactory suspensions were those made in a gelatine solution with a Manton-Gaulin (Fig. 1) colloid mill having the following specifications:

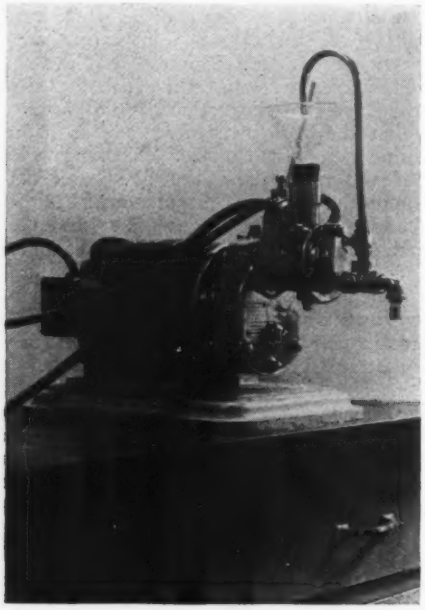

Fig. 1.
Manton-Gaulin Colloid Mill

Speed of motor	3400 r.p.m.
Speed of rotor	20000 r.p.m.
Approximate peripheral speed	10000 ft. per min.
Minimum clearance of rotor and stator	0.001 inch
Adjustment intervals of 0.001 inch.	

The size suspensions were prepared by making an approximate 2.5 per cent suspension of 60 mesh abietic acid in a 0.5 per cent gelatin solution and running it through the mill at different clearances of rotor and stator, and for varying lengths of time to obtain the desired particle size.

A small amount of the gelatin solution was mixed with the abietic acid until the acid appeared thoroughly wetted. The remainder of the gelatin solution was added in about 50-cc. portions with constant stirring by hand. The mixture was then agitated with an electric stirrer for about five minutes before portions were taken out for use in the colloid mill. After preparing the suspension, the foam was allowed to settle, and 2-cc. samples were taken and dried over night in an electric drying oven to determine the exact concentration of the abietic acid, allowance being made for the gelatin present.

When the size suspension was added to the beater, a sample was also taken for use in the determination of particle size by the use of the Zeiss Siedentopf cardioid ultramicroscope. This sample was diluted with water to a concentration such that the particles could easily be counted in the field defined by the Ehrlich stops of the ultramicroscope. The number of particles were counted in approximately one hundred different fields on each of two samples. The average number of particles in the field of known area and depth were obtained and used in the calculation of the particle size by the formula given below.

The Zeiss Siedentopf cardioid ultramicroscope is essentially a light concentrating apparatus which enables one to detect the presence of colloidal particles by virtue of the light reflected from them. Light rays from an arc lamp, brought to focus in the preparation to be studied, are scattered by the particles in suspension and become visible through the microscope as bright spots of light.

In determining the radius of particles with the aid of the ultramicroscope it was necessary to determine the following values:

The number of particles in a known volume of suspension.

The mass of the dispersed phase in the known volume of suspension observed.

The number of particles in a large number of fields of known area were counted, and their mass calculated from the known concentration of the suspension. Knowing these factors, the radius of the colloidal particle was calculated from the formula:

$$r = \sqrt[3]{\frac{3M}{4n\rho\pi}}$$

r = radius of particle in centimeters
M = mass of dispersed phase in the volume examined
n = number of particles in volume examined
ρ = density of the dispersed phase

Technique of Ultra Microscope Operation

The microscope was placed in line with the carbon arc about a foot from the cooling chamber which was placed between them. This chamber was filled with a 0.5 per cent solution of copper sulphate, which served to remove the heat waves from the light source. The arc was connected in series with the proper resistance for the current and voltage being used. The light was centered on the condenser by means of the micro-

scope mirror so that a symmetrical cone was supplied which could be observed as a circle of light on the top of the condenser.

The chamber for holding the suspension to be observed consisted of a quartz disc having a circular groove ground in it, the center portion of this disc being just a few microns above the level of the circular groove. This chamber, as well as the cover, was thoroughly cleaned by one of two methods: the wet method, which involved cleaning the cell in warm cleaning solution, rinsing with distilled water and alcohol, and drying in a current of warm air; or the dry method in which the cell is covered with collodion which is removed when dry, thus taking all of the grease and dirt with it. The chamber should never be rubbed dry with lens paper because this will give rise to bright shining streaks when viewed under the microscope, due to the presence of small amounts of grease. The dry method was found to be more satisfactory and convenient, two applications of collodion being used for each cleaning operation in order to insure complete removal of the grease and dirt.

For the purpose of observation, the cell was placed in the chamber mount, which consisted of a circular metal base with a thin flange upon which the chamber rested, a clamping ring and a clamping collar. The bottom of the specimen chamber was placed on the chamber mount and two drops of the suspension to be examined placed upon the raised central portion of the cell, the excess flowing over into the circular groove when the cell cover was placed over it. The chamber was held in position on the chamber mount by the clamping collar and ring. The clamping ring was tightened carefully to insure the same depth of liquid each time.

When the chamber and mount had been prepared, the condenser was racked down and a drop of glycerine applied to the surface, then the condenser was racked up until the immersion fluid touched the bottom of the chamber and covered it evenly. A drop of the immersion fluid was next placed on top of the chamber, and the preparation was ready for examination.

The sample was viewed first with the special objective "V" without an eyepiece. As the objective approached the preparation, the whole field appeared illuminated. The low Huygens eyepiece was inserted in the microscope, which was focused on the particles that now became visible. The condenser was allowed to remain in that position where the spot of light continued to expand whether the condenser was raised or lowered. The eyepiece was then changed to a higher power and the particles in a number of fields counted.

Calibration of Ehrlich Eyepiece Stops for Use with Zeiss Siedentopff Cardioid Ultramicroscope

In order to determine particle size, the number of particles in a volume of known concentration had to be counted. Surfaces of a definite area were separated from their surroundings with the aid of Ehrlich eyepiece stops placed in the ocular lens of the microscope. The exact dimensions of these stops were determined by comparison with a stage micrometer in the manner described below.

The cardioid condenser of the microscope was removed from the substage so that light would pass directly to the objective. Special objective "V" (n.a. 1.0, 90x) and eyepiece K_3O were used. A Zeiss stage micrometer (0.01 mm. divisions) was placed on the stage and brought into focus and the openings in several of the Ehrlich stops measured by comparing them with the divisions on the stage micrometer. The following values were obtained:

Stop No.	Length on a side	Area
1	0.0015 cm.	22.5 x 10^{-7}cm^2
2	0.002 "	40.0 x "
3	0.003 "	90.0 x "
4	0.0065 "	42.0 x 10^{-6}cm^2

Measuring Depth of Cell

The depth of the cell was measured with the aid of the calibrated micrometer adjustment by focusing sharply in succession upon particles which had settled out on the top and bottom of the cell, and noting the displacement. Each graduation of the micrometer adjustment was equivalent to 0.002 mm. Since the depth of the cell was found to vary with each sample, due to the amount of pressure used in screwing the cell holder together, it was thought advisable to make a measurement of the depth for each determination.

A bright field microscope and a Petroff Hausser bacteria counter were used to check the particle size in the larger range, but successful results were not obtained due to the fact that it was not possible to focus on the top and bottom of the cell at the same time. While the focus was being changed it was found that particles moved in and out of the field due to their rapid movement, resulting in considerable error.

Development of Sizing and Drying Procedure

Since the success of the problem at hand depended on a consistent sizing procedure, much consideration was given to this phase of the work.

A procedure was developed in much the same manner as suggested by Dreshfield, Haggerson, and Heller *(1)* in their work of size evaluation. Several of the variables such as freeness, quantities of rosin and alum used, and the degree of pressing given the sheets were determined arbitrarily, but represent the nearest approach to mill conditions that could be obtained with the material and apparatus at hand.

A 1.5 pound Niagara beater of the type used in making pulp strength tests by the TAPPI standard method was employed in the beating and sizing operation. The sheets were made on a British standard sheet machine which had been fitted with a sump large enough to hold the white water from one sheet. By means of a bronze gear pump the white water was returned from the sump to the sheet mould to dilute the stock for the next sheet. In this manner the same white water was used to dilute every sheet of a series in the sheet machine. This method was developed as a result of a study of the use of white water in the sheet making process by Peterson *(7)*. He found that a 20 per cent decrease in sizing value resulted when fresh water was used in the sheet machine, in place of water having *p*H of 4.5. Using heavier sheets, he found that those made with fresh water had a sizing value 50 per cent lower than those made with white water.

Pulp containing approximately 75 per cent moisture was broken into small pieces and a quantity added to the beater equivalent to 400 grams of oven-dry pulp. The pulp was made up to a consistency of 2 per cent with distilled water and beaten to a freeness of 190 cc ($\pm$5 cc) as determined by the Canadian standard freeness tester. When the proper freeness was reached the size suspension was added and al-

lowed to mix for fifteen minutes, followed by the addition of alum and another fifteen minutes of mixing. Two liters of stock was saved to be used in making sheets and the white water removed from the remainder by filtering it through two thicknesses of cheese cloth. Sufficient white water for making sheets was placed in the sheet machine and any remaining was used to dilute the two liters of stock to be used for sheets.

Sample sheets were first made and dried to constant weight to determine the exact consistency of the pulp suspension. Ten of these sheets were made in order to insure that equilibrium conditions had been attained in the white water in the sheet machine. From the oven-dry weight of the test sheets the correct amount of stock was calculated to give a sheet weighing 1.2 grams which correspond to a basis weight of 46.2 pounds 25 x 40-500.

In couching the sheets, felts soaked in white water were used instead of blotters to insure as little removal of rosin from the sheet as possible. Six sheets with their couch felts and press fillers were placed in the British standard press and the pressure raised to 50 lb. and released immediately. This short method of pressing was employed for two reasons: To insure a sufficiently moist sheet at the start of the drying operation for maximum sizing results and to shorten the procedure.

In developing a method for drying the sheets a small electric drying oven was used. Several runs were made in which sheets were dried at temperatures ranging from 105 to 140 deg. C., and for time intervals ranging from thirty minutes to three hours. Although higher temperatures and longer drying times gave slightly higher results, the values were found to be more irregular than those obtained on sheets dried at lower temperatures. Temperatures above 120 deg. C. also had a tendency to brown the sheets slightly. A higher basis weight was found to give no more consistent results than those obtained on sheets weighing 46.2 pounds 25 x 40-500. From these results the temperature range between 110 and 120 deg. C. was chosen for all succeeding work, since it more nearly represented mill conditions, Could be easily obtained and controlled in the Freas oven, and there was no danger of deteriorating the sizing. Six sheets were placed on the drying rings and dried at one time in the oven for an hour. Circulation was obtained in the oven by means of a small fan mounted on the inside wall, and driven by a small motor mounted on the outside as shown in Figs. 2 and 3.

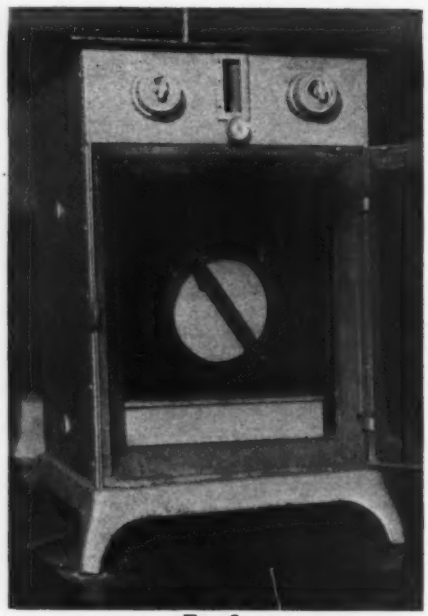

FIG. 2.
View of Sheets in Drying Oven Showing Circulating Fan

FIG. 3.
Motor Mounting for Driving Circulating Fan in Oven

The sizing values were obtained by use of the Valley size tester, the average of three size tests per sheet being recorded.

Size retention was determined by the method developed by Launer *(3)* using an extracting solution consisting of 4 ml. of concentrated hydrochloric acid to one liter of ethyl alcohol.

SIZING WITH SUSPENSION OF ABIETIC ACID:

The procedure of beating, addition of size suspension and alum, sheet making, pressing, drying, and size testing was performed for each run in the same

TABLE I

SUMMARY OF RESULTS RUNS NOS. 25-48

Run No.	Particle size	Basis Wt. 25x40-500	Alum added per cent	Rosin added per cent	Rosin retained per cent	Size test sec.
25	...	46.6	2.50	2.50	2.27	59
26	203	45.5	2.50	2.50	2.21	52
27	268	46.3	2.50	2.50	2.31	51
28	273	46.2	2.50	2.50	2.13	54
29	362	46.2	2.50	2.50	2.36	60
30	286	46.2	2.50	2.50	2.78	68
31	383	46.1	2.50	2.50	2.21	52
32	390	45.6	2.50	2.50	2.47	65
33	385	46.7	2.50	2.50	2.36	59
34	304	46.5	2.50	2.50	2.25	51
35	257	45.7	2.50	2.50	2.11	50
36	267	44.0	2.50	2.50	2.37	47
37	389	45.2	2.50	2.50	2.48	52
38	443	45.2	2.50	2.50	2.33	53
39	473	44.7	2.50	2.50	2.61	62
40	458	45.4	2.50	2.50	2.54	55
41	461	46.2	2.50	2.50	2.45	52
42	607	45.4	2.50	2.50	2.20	33
43	552	45.2	2.50	2.50	2.13	32
44	560	46.2	2.50	2.50	2.37	33
45	524	45.2	2.50	2.50	2.49	35
46	811	44.0	2.50	2.50	2.31	5
47	942	44.4	2.50	2.50	2.19	8
48	1671	45.7	2.50	2.50	2.31	4

Particle size in millicrons radius.
Size test values obtained with Valley size tester.

TABLE II

SIZING VALUES RUNS NOS. 52 AND 60

Sheet no.	Run No. 52 Particle size 298 mμ Basis Wt. 25x40-500	Size Test seconds	Run No. 60 Particle size 413 mμ Basis Wt. 25x40-500	Size Test seconds
2	46.2	87	45.8	61
3	46.2	84	45.8	59
4	45.7	80	45.8	61
6	45.7	85	45.8	60
7	45.5	89	45.8	71
8	45.5	74	46.2	67
10	45.5	77	45.8	66
11	45.5	69	45.8	71
12	45.5	78	46.2	72
14	45.5	76	45.8	63
15	45.5	77	44.2	54
16	45.7	78	45.2	67
18	46.8	85	45.2	71
19	46.2	78	45.5	76
20	46.2	75	46.2	76
22	46.2	73	46.2	63
23	46.2	81	46.2	67
24	46.2	81	46.2	64
Maximum	46.8	89	46.2	72
Minimum	45.5	69	44.2	54
Average	45.7	79	45.8	66
Alum added	2.50 per cent		2.50 per cent	
Rosin added	2.50 per cent		2.50 per cent	
Rosin retained	2.14 per cent		2.29 per cent	

TABLE III

SUMMARY OF RESULTS RUNS NOS. 49-67

Run No.	Particle size	Basis Wt. 25x40-500	Alum added per cent	Rosin added per cent	Rosin retained per cent	Size test sec.
49	226	46.2	2.50	2.50	2.12	77
50	255	43.4	2.50	2.50	2.50	72
51	275	44.4	2.50	2.50	2.09	73
52	298	45.7	2.50	2.50	2.14	79
53	307	45.2	2.50	2.50	2.21	76
54	279	46.7	2.50	2.50	2.09	84
55	341	46.2	2.50	2.50	2.13	79
56	335	45.8	2.50	2.50	2.15	75
57	339	44.4	2.50	2.50	2.19	74
58	337	46.2	2.50	2.50	2.37	75
59	399	45.2	2.50	2.50	2.20	60
60	412	45.8	2.50	2.50	2.29	66
61	428	46.5	2.50	2.50	2.06	62
62	507	45.8	2.50	2.50	2.47	31
63	505	46.2	2.50	2.50	2.54	36
64	590	44.4	2.50	2.50	2.49	21
65	584	45.8	2.50	2.50	2.29	26
66	688	45.2	2.50	2.50	2.25	5
67	678	45.4	2.50	2.50	2.42	3

Particle size expressed in millimicrons radius.
Size test values determined by the Valley size tester.
Basis weight in pounds 25 x 40-500.

manner as outlined in the procedure above. An attempt was made to prepare size suspensions with increasing particle size from the smallest which could be produced to those having a radius of one micron. The results of Runs 25-48 are listed in Table I, and are shown graphically in Figs. 4 and 5.

From the results shown above, it was apparent that there was a definite drop in the sizing value when suspensions above a certain particle size were used. The results presented here were only relative, however, since the method of particle size determination for these runs was found to be slightly inaccurate. In suspensions containing particles less than 400 millimicrons in radius, the particles usually showed some

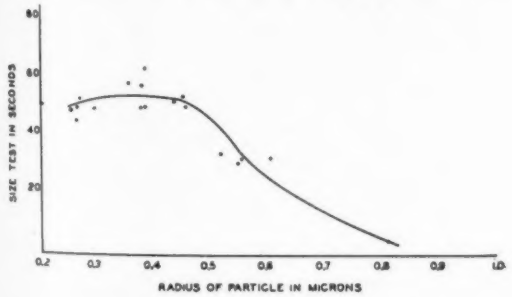

FIG. 4.

Preliminary Investigation of the Effect of Particle Size upon the Degree of Sizing Imparted to Paper by a 100 per cent Free Suspension of Abietic Acid

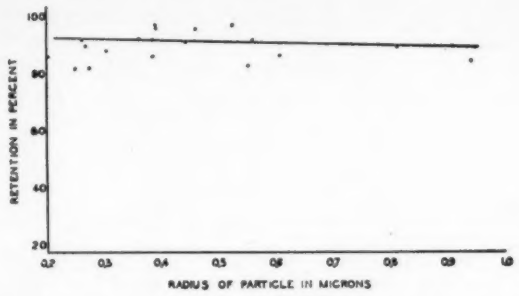

FIG. 5.

Preliminary Investigation of the Effect of Particle Size upon Size retention in a Paper Treated with a 100 per cent Free Suspension of Abietic Acid.

motion for a time under the ultramicroscope, and the original method of counting only those which were moving was sufficiently accurate. Above this size some of the larger particles precipitated rather quickly on both the top and the bottom of the counting cell, thus making it necessary to count those which had precipitated in order to obtain the greatest accuracy, which at best was subject to some error.

The work was repeated in runs No. 49 to 67, the particle size being determined by the ultramicroscope as before, with the exception that all particles whether moving or stationary were counted and their number used in the calculation.

Data for runs No. 52 and 60 is shown in Table II to illustrate the type of values obtained in typical runs. The results of all the runs of this series are summarized in Table III and are shown graphically in Fig. 6 and Fig. 7.

The results shown in Table III clearly indicated that, below an average particle size of 350 millimicrons radius, there was no change in sizing values obtained with abietic acid suspensions when these sizes were used under identical conditions. In the range between 350 and 400 millimicrons radius there was a slight change in sizing value, with a very marked decrease in the range between 400 and 500 millimicrons, and another sharp decrease between 600 and 700 millimicrons radius. Throughout the whole range, the rosin retention was constant within the limit of experimental error, which was 10 or 15 per cent.

The conclusion may therefore be reached that irrespective of the manner in which the rosin was held to the fiber, the particle size did have a definite effect upon the sizing value in free rosin suspensions. Furthermore, the results indicated that sizing comparable to that obtained from commercial rosin sizes could be obtained with a 100 per cent free suspension of a rosin acid without the aid of an alkali.

SIZING WITH COMMERCIAL MATERIALS:

Several runs were made with commercial materials using the procedures outlined for the work above, in order to obtain data comparable to that obtained with abietic acid suspensions.

"H" grade rosin suspended in gelatin solution:

The rosin suspension was prepared by circulating 20 ml. portions of a suspension of 60 mesh "H" grade rosin in a 0.5 per cent gelatin solution through the colloid mill for 30 seconds at 0.013 inch clearance, and for 2.5 minutes at 0.010 inch clearance.

The same sizing and testing procedure was followed as in the foregoing runs made with abietic acid. The results are shown in Table IV.

TABLE IV

SIZING VALUES OF "H" GRADE ROSIN-GELATIN SUSPENSION

Sheet no.	Run No. 68 Particle size 389 mμ Basis Wt. 25x40-500	Size Test seconds	Run No. 69 Particle size 411 mμ Basis Wt. 25x40-500	Size Test seconds
2	44.2	54	43.4	50
3	42.6	52	43.4	56
4	43.7	53	43.4	46
6	42.6	56	44.2	56
7	42.6	52	44.2	47
8	43.7	51	44.4	53
10	43.4	49	44.4	43
11	43.4	51	44.7	52
12	43.4	61	44.7	49
14	44.2	58	44.7	43
15	44.2	51	44.4	44
16	44.2	48	44.7	49
18	44.2	65	45.5	53
19	44.2	57	46.2	56
20	44.4	57	45.5	45
22	44.2	53	46.2	49
23	44.2	49	46.2	51
24	43.4	48	45.5	46
Maximum	44.4	65	46.2	56
Minimum	42.6	48	43.4	43
Average	43.7	54	44.7	49
Alum added	2.50 per cent		2.50 per cent	
Rosin added	2.50 per cent		2.50 per cent	
Rosin retained	2.29 per cent		2.25 per cent	

Size test values obtained with the Valley size tester.
Basis weight in pounds 25x40-500.

TABLE V

SIZING VALUES OBTAINED WITH 2.5 PER CENT HIGH FREE ROSIN SIZE

Sheet no.	Run No. 72 Particle size 251 mμ Basis Wt. 25x40-500	Size Test seconds	Run No. 73 Particle size 277mμ Basis Wt. 25x40-500	Size Test seconds
2	44.2	63	45.2	63
3	44.7	56	45.2	66
4	44.7	55	45.2	61
6	44.7	63	45.2	72
7	44.7	59	45.2	71
8	44.7	57	45.2	68
10	44.4	49	45.2	62
11	44.7	57	44.7	59
12	44.7	71	44.7	75
14	45.5	64	44.7	67
15	45.5	57	44.4	61
16	45.5	59	44.4	58
18	45.2	65	44.4	69
19	45.5	66	44.4	75
20	45.5	62	44.4	66
22	45.5	57	44.4	57
23	45.5	57	45.5	60
24	45.5	72	45.5	73
Maximum	45.7	72	45.7	75
Minimum	45.2	49	45.2	57
Average	45.5	61	45.5	66
Alum added	2.50 per cent		2.50 per cent	
Rosin added	2.50 per cent		2.50 per cent	
Rosin retained	1.85 per cent		2.09 per cent	
Free rosin	80.30 per cent		80.30 per cent	

Size test values obtained with the Valley size tester.
Basis weight in pounds 25x40-500.

Sizing with commercial high free rosin size:

Two and one-half per cent of commercial high free rosin size was added to the pulp in the beater in the same manner as the abietic acid suspension. The sheets were made and tested by the same methods employed in the previous runs. The particle size of the free rosin present in the size was obtained by the use of the ultramicroscope, allowance being made for the 19.7 per cent rosin in the combined state. A quantity of gelatin, equal to the amount added in the abietic acid suspension, was added to the size in order to make the results comparable. The data obtained are shown in Table V.

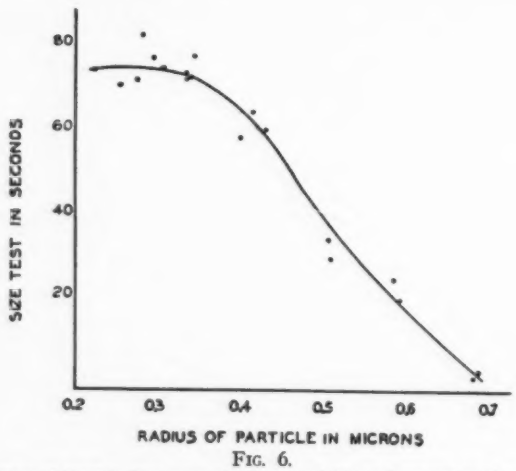

FIG. 6.

Effect of Particle Size upon the Degree of Sizing Imparted to Paper by a 100 per cent Free Suspension of Abietic Acid.

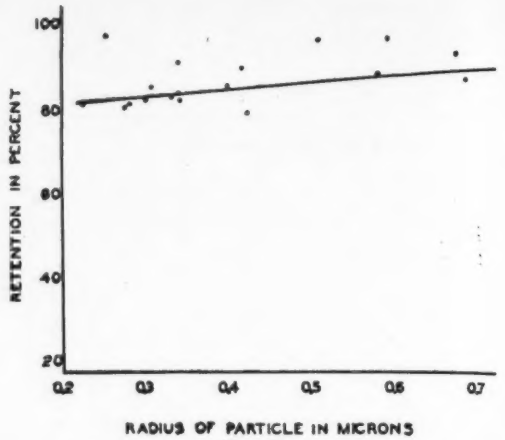

FIG. 7.

Effect of Particle Size upon Size Retention in a Paper Treated with a 100 per cent Free Suspension of Abietic Acid.

Sizing with commercial dry size:

The size solution was prepared by dissolving a sufficient amount of dry rosin size powder in warm water to make an approximate 2.5 per cent solution. The size was added to the beater in the same manner as in the previous runs, the same amount of gelatin being added as in the runs with abietic acid. Table VI shows the sizing values obtained with this size solution.

The results which were obtained using "H" grade rosin indicated that it had about 83 per cent of the sizing efficiency of an abietic acid suspension of the same particle size ultilized under the same conditions. The values obtained with high free rosin size con-

TABLE VI

SIZING VALUES OBTAINED WITH DRY SIZE

Sheet no.	Run No. 74 Basis Wt. 25x40-500	Size Test seconds	Run No. 75 Basis Wt. 25x40-500	Size Test seconds
2	43.4	29	44.7	35
3	43.4	28	44.7	35
4	43.4	31	44.7	34
6	44.2	34	44.7	40
7	44.2	42	44.7	39
8	44.2	39	44.4	37
10	44.2	37	44.7	34
11	43.4	35	44.7	34
12	43.4	48	44.7	45
14	43.4	41	44.7	36
15	43.4	38	44.7	37
16	43.4	37	45.2	34
18	43.4	53	45.5	44
19	43.4	48	44.7	36
20	43.4	44	44.7	36
22	44.7	43	44.7	34
23	44.7	40	44.7	34
24	44.7	43	45.5	43
Maximum	45.2	52	45.7	48
Minimum	43.7	28	44.7	34
Average	44.4	39	45.2	37
Alum added	2.50 per cent		2.50 per cent	
Rosin added	2.50 per cent		2.50 per cent	
Rosin retained	1.85 per cent		1.93 per cent	

Free rosin in size solution 10.20 per cent.
Size test values obtained with the Valley size tester.
Basis weight in pounds 25x40-500.

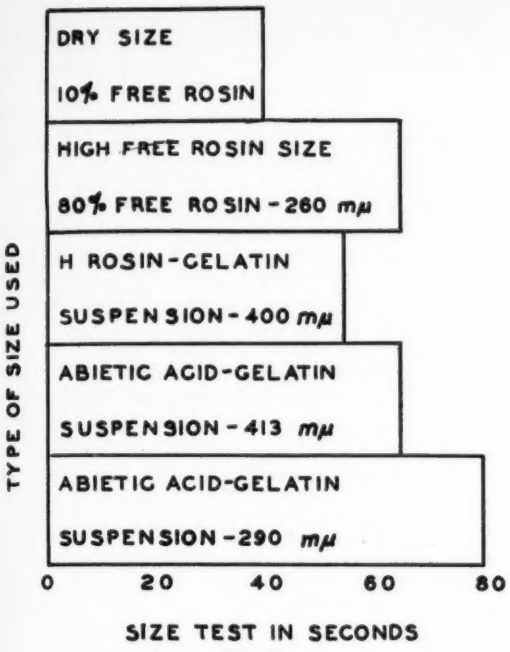

FIG. 8.

Comparison of Sizing Results Obtained on Papers Treated with Sizes of Different Types

taining 80.3 per cent free rosin and composed of particles about 265 millimicrons in radius, showed that it had about 88 per cent of the sizing efficiency of an abietic acid suspension of approximately the same particle size. The results obtained with a size containing only 10 per cent free rosin were 49 per cent as high as the abietic-acid gelatin suspension. The sizing results obtained with the various sizing media used are shown graphically in Fig. 8.

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Effect of Rate of Feed of Wood to Stone at Various Stone Surface Speeds in the Groundwood Process*

By E. R. Schafer[1], and J. C. Pew[1]

Abstract

Spruce wood was ground at several speeds of stone surface and with several rates of advance of wood at each of these speeds. With a fixed ratio of surface speed to wood advance, an increase in speed resulted in the production of pulps of lower strength without much change in unit energy consumption. This effect was more pronounced at high ratios of surface speed to wood advance than at low.

Increasing the length of stone surface passing the wood per unit of wood advance, at a constant stone speed (that is, decreasing the wood advance rate) resulted in pulps of increasing bursting strength, tensile strength, and solid fraction, and of decreasing freeness but at the expense of unit energy consumption and production rate. The average fiber length was only slightly affected. The greater lengths of stone surface passing the wood apparently permit a processing of fiber to occur before detachment from the wood.

Conflicting opinion exists among producers of groundwood pulp as to the effects of the rate of wood-feed and of the surface speed of the grindstone. Very wide variations in the rate of wood-feed are employed in commercial practice. Studies on the effects of various wood-feed rates on energy consumption and pulp quality have in the past usually been obtained indirectly by means of pressure changes. This paper presents the results of experiments at the Forest Products Laboratory in which the effect of the wood-feed rate and, also, the effect of the rate of speed of the stone surface were determined by direct control.

Experimental History

Thickens and McNaughton *(8)*, in a series of ex-

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periments on white spruce, show an improvement in the bursting strength of groundwood pulps with a reduction in the stone speed in spite of simultaneous pressure increase. Furthermore, this occurred without appreciable change in the energy consumption. Thus, in terms of energy and strength, the groundwood process is more efficient at low speeds. Brecht *(1)*, working with an experimental grinder, also, finds that decreasing the speed increases the strength, but increases the unit energy consumption as well. The net result, however, as with Thickens and McNaughton, was better economy at low speeds. Johnston, at the Forest Products Laboratories of Canada, is of the opinion *(4)*, that equal qualities of pulp may be obtained at any stone speed or pressure or both if the stone surface is properly adjusted. The work of Holland, Jones, and Johnston *(3)*, with a semicommercial grinder, and of Edwards, Jones, Potter and Johnston *(2)*, with a miniature grinder, show only a slight reduction in the energy consumption and the strength with increasing speed up to nearly double that of the ordinary practice.

McAdam *(5)*, reports that a satisfactory newsprint pulp was produced on a commercial grinder operated at a high stone surface speed (5,400 to 6,000 feet per minute). The grinder production was increased 50 per cent thereby. Although the comparative energy consumption per ton for low-speed and high-speed grinding was not given, the reported figures for the high-speed grinding were within the range of ordinary practice. On the other hand, a new Canadian mill *(6)*, where production of a high quality of groundwood was desired, installed low-speed grinders, operating at 3,700 surface feet per minute.

Experimental Procedure

Grinder Drive

The experiments, here reported, were conducted in the Forest Products Laboratory experimental grinder. The stone of this machine can be driven at six speeds by means of a two-speed motor and a three-speed reduction gear. A description of the grinder has been published *(7)*. In the present experiments only four speeds, distributed over the whole range, were used. They were approximately 3,160, 4,220, 5,040, and 6,740 feet per minute. The actual speeds varied slightly from these figures due to differences in motor slip with variation in load.

Advance Rates and Control

Rectangular blocks of white spruce wood were ground, using the central or vertical grinder pocket only.

At each speed, advance rates of wood to stone were selected so as to allow four different lengths of travel of the stone surface for a given thickness of wood ground. These lengths were 1.5, 3.0, 4.5, and 6.0 feet of stone surface per 0.001 inch of wood advance. The unit of 0.001 inch was selected because of its approximation to the diameter of a wood fiber. The rate of 3 feet of stone surface per 0.001 inch of wood corresponds to average commercial practice. The feed rate was accurately controlled by manual adjustment of the pressure in the hydraulic cylinder so as to maintain the telltale indicator attached to the pressure foot on a level with a plum bob arranged mechanically to drop at a definite speed.

Constant Temperature and Consistency

The conditions of the experiments, other than speed and feed rates, were maintained as nearly constant as possible. The surface of the artificial stone could be considered constant since it was well beyond the initial stages of wear and the experiments were of short duration. The blocks of wood for all experiments were taken from the same logs and though small and numerous knots were present it is not likely that major differences existed between one batch of wood and another. The pit temperature was held at 150 deg. F. by means of a temperature controller, and the consistency was controlled by manipulating the temperature of the shower water. Since the amount of wood ground was small, a false pit consisting of a sheet metal trough was installed in the grinder in order to bring the consistency rapidly up to normal, after starting the experiment. This trough, which allowed 3 inches of radial clearance and 2½ inches at each side of the stone, accomplished its purpose but it unfortunately interfered somewhat with the pulp circulation. The cylinder pressures were read periodically, the frequency depending on the rate of advance of wood, and the readings averaged.

The pulps were tested according to the standard Forest Products Laboratory methods. *(9)* The grinding data and properties of the resulting pulps, given in table 1, are grouped in two ways: (1) experiments with the same amount of stone surface passing per 0.001 inch of wood ground, and (2) experiments at the same surface speed.

Results and Discussion

Analyzing the data in series 1a, 1b, 1c, and 1d in table 1, it appears that when a given length of surface is used to remove a unit thickness of wood, increase in the stone speed has no direct influence on the unit energy consumption of the pulp but decreases the pulp strength. When the ratio of the surface speed to the wood advance rate is relatively high (series 1b, 1c, and 1d) this strength decrease is substantial, but when the ratio is low (series 1a) the effects are small. The 24-mesh screen fraction of the pulps is somewhat larger at low than at high surface speeds. In the first three series the pulp is slower (that is, has a lower freeness) in both the highest and the lowest speed runs than at the intermediate speeds, but this relationship breaks down in the fourth series where the ratio of speed to feed is high. The average pressure necessary to maintain a given ratio of the surface speed to the wood advance rate tends to decrease with increasing stone speed. The average pressure, as would be expected, also, decreases as the speed-feed ratio increases.

Loss in Strength

The decrease in pulp strength and the amount of the 24-mesh screen fraction with an increase in the stone speed may be observed in series 2 where results for all speed-feed rate ratios are averaged. Several factors may be involved in the loss of strength with a speed increase. For instance, it is logical to suppose that the wood being of a plastic nature might yield differently to the stone, depending on the velocity of impact of the stone grit. Again, when the stone speed is increased and the surface speed-feed ratio is maintained the same, the increased rate of wood advance (see column 4, Table I) allows the continuously renewed surface of wood less time to be affected by the higher temperature of the contact zone. Lastly, pulp circulation is affected by the speed due to

the difference in centrifugal force tending to throw the pulp from the stone and the difference in the agitation of the pulp in the grinder pit.

Advantages of High-Speed Grinding

It does not necessarily follow that the loss in strength prohibits the use of high-speed grinding since the advantages of increased production may more than offset this disadvantage. For instance, if operating under the average conditions illustrated by grinder run 322, and some loss in strength is permissible, an increase of 34 per cent in surface speed (namely to 4,220 feet per minute) will increase production about 41 per cent and lower the bursting strength about 8 per cent. Increasing the speed about 114 per cent (to 6,730 feet per minute) will increase production 126 per cent and lower the bursting strength about 20 per cent, all without appreciably increasing the energy consumption per ton.

Effects of Rate of Feed

Series 2 shows the effect of increasing the length of stone surface passing the wood per unit of wood advance at the four approximately fixed surface speeds. At a given speed, pulps of increased bursting strength, tensile strength, and solid fraction, and of decreased freeness are produced but at the expense of the unit energy consumption and the production rate. The effect seems to be a processing of the fiber before it is completely detached from the wood, a longer stone travel furnishing more bruising impacts. It will, also, be noted that such processing is accomplished without substantial change in the fiber length, there being only a slight reduction in the amount of the 24-mesh screen fraction and practically no change in the other fractions in any one series.

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TABLE I.—THE EFFECT OF RATE OF FEED OF WOOD TO STONE AT VARIOUS STONE SURFACE SPEEDS

Series number	Grinder run number	Grinding conditions [1]: Stone surface speed-wood advance ratio,[2] feet	Rate of wood advance, in./min.	Speed of stone surface, ft./min.	Average pressure of wood-stone contact, lb./sq. in.	Power input to stone, hp.	Oven-dry wood ground, tons/24 hr.	Energy consumed per ton dry wood, hp. days	Properties of pulp suspension: Freeness Schopper-Riegler, cc.	Screen analysis: Retained on 24 mesh, per cent	Retained between—: 24 and 42 mesh, per cent	42 and 80 mesh, per cent	80 and 150 mesh, per cent	Passing 150 mesh, per cent	Average screen opening,[3] mm.	Properties of pulp test sheets: Bursting Per lb. per ream 25 x 40 x 500: Points	Grams	Tearing per square inch: Tensile Pounds	Solid fraction
1a	321	1.5	2.09	3140	45.8	98.5	1.69	58.2	355	16.6	10.6	15.0	13.4	44.4	0.095	0.29	0.72	1540	0.28
	325	1.5	2.80	4210	45.2	123.0	2.23	55.2	410	19.2	10.7	15.6	13.7	40.8	.101	.24	.71	1390	.27
	329	1.5	3.34	5000	47.0	145.2	2.88	50.4	403	11.9	11.6	16.4	15.6	44.5	.094	.23	.69	1230	.26
	333	1.5	4.48	6710	34.2	206.0	3.79	54.3	355	11.0	11.5	16.4	16.2	44.9	.093	.24	.70	1420	.28
1b	322	3.0	1.05	3150	25.4	57.8	.84	68.7	287	15.0	10.5	15.1	14.2	45.2	.094	.36	.73	2025	.30
	326	3.0	1.40	4220	23.8	85.4	1.18	72.2	312	13.8	8.9	16.6	15.3	45.4	.093	.33	.69	1915	.30
	330	3.0	1.67	5030	22.6	95.7	1.39	68.3	338	11.0	11.6	16.6	15.8	45.0	.093	.29	.75	1715	.28
	334	3.0	2.25	6730	18.6	135.0	1.90	70.6	297	8.5	12.6	16.5	15.6	46.8	.090	.29	.63	1805	.29
1c	323	4.5	.70	3160	17.5	45.0	.57	78.4	278	15.2	9.9	14.4	14.8	45.7	.091	.41	.76	2575	.32
	327	4.5	.94	4220	17.5	65.3	.78	84.2	288	12.7	10.9	17.1	15.6	43.7	.095	.36	.76	2225	.31
	331	4.5	1.12	5040	17.5	81.3	1.01	80.5	312	16.6	11.6	16.8	13.5	41.5	.100	.33	.71	1930	.28
	335	4.5	1.50	6740	12.4	132.3	1.51	87.7	255	7.7	11.5	18.5	15.7	46.6	.090	.32	.69	2100	.30
1d	324	6.0	.53	3160	15.3	37.6	.43	87.8	268	16.4	11.2	14.0	13.7	44.7	.094	.40	.80	2480	.32
	328	6.0	.70	4220	15.3	59.4	.59	99.3	222	9.4	11.0	16.0	15.7	47.9	.089	.41	.71	2465	.31
	332	6.0	.84	5050	12.4	61.7	.71	87.3	257	9.6	10.9	18.9	16.6	44.0	.094	.38	.71	2280	.31
	336	6.0	1.13	6750	11.0	95.4	1.03	92.3	233	8.5	9.9	18.5	15.5	47.6	.089	.34	.68	2050	.31
2a	321	1.5	2.09	3140	45.8	98.5	1.69	58.2	355	16.6	10.6	15.0	13.4	44.4	.095	.29	.72	1540	.28
	322	3.0	1.05	3150	25.4	57.8	.84	68.7	287	15.0	10.5	15.1	14.2	45.2	.094	.36	.73	2025	.30
	323	4.5	.70	3160	17.5	45.0	.57	78.4	278	15.2	9.9	14.4	14.8	45.7	.091	.41	.76	2575	.32
	324	6.0	.53	3160	15.3	37.6	.43	87.8	268	16.4	11.2	14.0	13.7	44.7	.094	.40	.80	2480	.32
	Average	...	...	....	...	....	...	73.3	...	15.8	...	...	...	...	....	.37	.75	2155	...
2b	325	1.5	2.80	4210	45.2	123.0	2.23	55.2	410	19.2	10.7	15.6	13.7	40.8	.101	.24	.71	1390	.27
	326	3.0	1.40	4220	23.8	85.4	1.18	72.2	312	13.8	8.9	16.6	15.3	45.4	.093	.33	.69	1915	.30
	327	4.5	.94	4220	17.5	65.3	.78	84.2	288	12.7	10.9	17.1	15.6	43.7	.095	.36	.76	2225	.31
	328	6.0	.70	4220	15.3	59.4	.59	99.3	222	9.4	11.0	16.0	15.7	47.9	.089	.41	.71	2465	.31
	Average	...	...	....	...	....	...	77.7	...	13.8	...	...	...	...	....	.34	.72	1999	...
2c	329	1.5	3.34	5000	47.0	145.2	2.88	50.4	403	11.9	11.6	16.4	15.6	44.5	.094	.23	.69	1230	.26
	330	3.0	1.67	5030	22.6	95.7	1.39	68.3	338	11.0	11.6	16.6	15.8	45.0	.093	.29	.75	1715	.28
	331	4.5	1.12	5040	17.5	81.3	1.01	80.5	312	16.6	11.6	16.8	13.5	41.5	.100	.33	.71	1930	.28
	332	6.0	.84	5050	12.4	61.7	.71	87.3	257	9.6	10.9	18.9	16.6	44.0	.094	.38	.71	2280	.31
	Average	...	...	....	...	....	...	71.6	...	12.3	...	...	...	...	....	.31	.72	1789	...
2d	333	1.5	4.48	6710	34.2	206.0	3.79	54.3	355	11.0	11.5	16.4	16.2	44.9	.093	.24	.70	1420	.28
	334	3.0	2.25	6730	18.6	135.0	1.90	70.6	297	8.5	12.6	16.5	15.6	46.8	.090	.29	.63	1805	.29
	335	4.5	1.50	6740	12.4	132.3	1.51	87.7	255	7.7	11.5	18.5	15.7	46.6	.090	.32	.69	2100	.30
	336	6.0	1.13	6750	11.0	95.4	1.03	92.3	233	8.5	9.9	18.5	15.5	47.6	.089	.34	.68	2050	.31
	Average	...	...	....	...	....	...	76.2	...	8.9	...	...	...	...	....	.30	.68	1844	...

[1] Constant conditions were:
Stone—Norton 3760/5-N7 composed of silicon carbide abrasive. Surface dressed with a 10-cut, 1½-inch lead spiral burr. Stone was used 71 hours (3-pocket, 3150 f.p.m. equivalent) before starting experiments.
Grinder pit temperature—150 deg. F.
Grinder pit consistency varied from 3.2 to 5.0 per cent.
Grinder stone immersion—7 inches.
Shower water—zeolite softened, varying in temperature from 63 to 90 deg. F.
Wood—white spruce, shipment 1502, density 22.4 pounds per cubic foot and dryness 67.8 per cent.
Wood charged as rectangular blocks 6 inches long and filling the pocket to a width of 14.75 inches. The center pocket only was used.
[2] The length of stone surface passed per 0.001 inch of wood ground.
[3] A factor calculated from the screen analysis related empirically to the average fiber length of the pulp.

Cross-Sectional Dimensions of Fibers In Relation to Paper-Making Properties of Loblolly Pine*

By J. C. Pew[1] and R. G. Knechtges[2]

Abstract

Fiber measurements in transverse sections of second-growth loblolly pine of both rapid- and slow-growth rates and containing high, medium, and low volumes of springwood indicate: Wood of slow growth, on the average, has thicker walled summerwood cells than that of fast growth, but the springwood cells average about the same wall thickness for both types of wood; neither the springwood nor the summerwood fibers vary widely in cross-sectional dimensions with the height in the same tree; and both the springwood and the summerwood fibers in trees of the same growth-rate class may vary considerably from tree to tree in the average cross-sectional dimensions at points of equivalent springwood content.

Although the widely different wall thicknesses of springwood and summerwood and their effect on paper making properties are recognized, the effect of variations which may occur in the fiber dimensions of either component has not been so apparent. Certain results obtained in the pulping work at the Forest Products Laboratory have indicated some departure of the observed effects of springwood and summerwood from the general trend. These anomalies may be traceable in some instances to the variability of the fiber dimensions. It seems evident from this investigation that the classification of the wood, according to the growth rate and the springwood-summerwood ratio only, is not sufficient to characterize completely the material for pulping purposes, but that the relationship of the springwood-summerwood ratio to the specific gravity must also be taken into consideration.

The large variation in wall thickness between fibers in the springwood and in the summerwood of the southern pines has generally been recognized as an important factor in the pulping of these woods. Wood technologists have long known of the differences in the dimensions of fibers produced at various times during the growing season. Roth (*1*) observed that the walls of the springwood cells of several of the southern pines were about half as thick as those of the summerwood cells, and that generally the thickness of any side varied inversely as the width of that side. This gave him the idea that all cells might be composed of equal amounts of material and that in the process of growth, they had a tendency to distribute equal amounts to each of the four to six sides. He, also, observed that generally, except in extreme cases, the rate of growth did not affect the thickness of the cell wall; the fibers of wide rings having no thicker walls than those of narrow rings. Gerry (*2*) reports that in certain specimens of large virgin growth southern pine and Douglas fir the summerwood tracheids in any given ring were shorter than the springwood tracheids and that no marked relation was found between the width of ring and the fiber dimensions. Studies by Klem (*3*) have shown the density of spruce wood was not dependent alone on the widths of the annual rings of the summerwood but, also, on the form of the tracheids and the thickness of their walls.

The larger amount of wood composed of thick-walled "late" fibers found in southern pine as compared with northern and European conifers is, according to Nilsson (*4*), accountable for the differences in the properties of the kraft paper made from these woods. Bray and Curran (*5*) and Chidester, McGovern, and McNaughton (*6*) have found the properties of southern pine kraft and sulphite pulps, containing large proportions of springwood fiber, to be markedly different from pulps containing large proportions of summerwood fiber, and attribute this to the collapsed ribbon-like characteristics of the former, in contrast to the noncollapsed tube-like characteristics of the latter. Chidester and McGovern (*7*) note similar effects in the pulping of western hemlock.

In the work on the pulping of southern pine at the Forest Products Laboratory, information was obtained on the cross-sectional dimensions of the fibers in several types of the wood. Although it was not possible in the present instance to make an extensive investigation, the number of observations was sufficiently large as to indicate certain interesting relationships.

Procedure

A rapid and a relatively slow growth tree were selected from a shipment of loblolly pine, no. 1459. Since, in these trees the springwood content increased with height, samples of varying springwood content were obtained by cutting discs at various heights in each. The volume of springwood was obtained by the Forest Products Laboratory method (*8*). In addition, one disc was taken for study from each of four other fast-growth trees; also, a disc from a spruce log was included for comparison. A ½-inch cube was cut from each disc at a distance from the pith of about two-thirds of the radius, the purpose being to obtain fibers at a point where there were nearly equal volumes of wood inside and outside. Transverse sections were cut from the cubes with the microtome and permanently mounted. The slides were projected on a horizontal screen at a magnification of 800 times and the images of the fibers measured with a rule. Traversing the section radially and taking care to avoid cells that had obviously been cut near their ends, measurements were made of each cell cavity and an adjacent double wall in both the radial and

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the tangential directions. The section was traversed three times in this manner, each time from a different starting point. The dimensions of approximately 800 cells were thus measured on each specimen. The ½-inch cubes were split into their springwood and summerwood components and the specific gravities of each type of wood determined by weighing in air, in water, and after drying in an oven at 110 deg. C.

Discussion of Results

The average dimensions of the cross section of the fibers of springwood and summerwood in the several samples of the loblolly pine are shown in Table I. Considering the springwood in the samples from the rapid-growth tree M and the slower growth tree JJ, no great variation in average outside dimensions or average wall thicknesses of the fibers in either the radial or tangential direction is apparent. Likewise, with the summerwood fibers, the average outside dimensions and average radial wall thicknesses in both growth rate classes are roughly the same, but the average tangential wall thicknesses are decidedly greater in tree JJ (slow growth) than in tree M (rapid growth). Moreover, in both trees the summerwood fibers highest in the tree tended to be somewhat thinner walled than those lower down. It would appear, then, that the springwood fibers in both fast- and slow-growth trees have, on the average, about the same cross-sectional dimensions, whereas, the summerwood fibers tend, on the average, to be thicker walled in slow-growth material.

The question naturally arises whether or not these few observations can be regarded as typical of each growth-rate class. Since accurate measurements of a large number of samples would be very laborious, an indirect indication was obtained from a consideration of the density-springwood content relationships of the discs cut from the 206 logs comprising the entire shipment. Suppose, for instance, in a given growth-rate class, the average fiber dimensions of the springwood and of the summerwood were each fixed, then, since the density of the wood substance is more or less constant, the specific gravity of each of these two components would be fixed. The specific gravity of any sample of wood would then be dependent, without consideration of the slight effects of resins and other extractives, on its proportion of springwood and summerwood and the plot of specific gravity against the springwood content would be a straight line. On the other hand, if samples of wood of various specific gravities were found to have the same springwood content, either the springwood or the summerwood, or both, must have various specific gravities. This would mean that there would be different amounts of wood substance in a given volume; therefore, different fiber dimensions.

The weight of the wood substance in a given volume of wood depends principally on two factors, the outside diameter of the fibers, and the wall thickness of the fibers. The factor of length is generally of lesser importance since the thicker-walled tips represent but a small proportion of the total fiber. Reducing the diameter of the fibers without changing their wall thicknesses increases the number of fibers in a unit volume and, therefore, increases the amount of wood substance. Increasing the wall thickness, also, increases the amount of wood substance. Both factors may vary independently of each other and although, conceivably, one might compensate the effect of the other, this seems an unlikely occurrence. Therefore, it may be assumed that if the specific gravities of two samples with the same springwood content are about equal, the average fiber dimensions are probably the same in each, and if the specific gravities are different then a difference in fiber dimension unquestionably exists.

Fig. 1 is a plot of the specific gravity against the springwood for all the logs in shipment 1459. On the basis of the foregoing discussion, it is apparent that considerable variation in fiber dimensions exists in given springwood content classes, particularly in wood of rapid growth rate.

Further study of Fig. 1 reveals that in many cases if one log in a tree is of low (or high) specific gravity in relation to the springwood content, the low (or high) relationship persists for all logs throughout the entire tree. The points, representing samples from trees J and G, have been connected with dotted lines to illustrate this point. Other "high density" and "low density" trees may, also, be traced out.

Average lines have been drawn on Fig. 1 through the points representing two growth-rate classes, namely between 5.2 and 23.4 rings per inch (average 12.7) and between 1.6 and 3.3 rings per inch (aver-

TABLE I.—CROSS-SECTIONAL DIMENSIONS OF FIBERS IN LOBLOLLY PINE SAMPLES SELECTED FROM SHIPMENT 1459

	Disc properties [3]			Specimen properties [4]				Average dimensions of fiber cross sections [5]									
								Springwood						Summerwood			
						Specific gravity oven-dry weight per green volume		Outside dimension		Inside dimension		Wall thickness		Outside dimension		Inside dimension		Wall thickness	
Disc No.[1]	Relative height above stump,[2] per cent	Springwood by volume, per cent	Growth rate, rings per inch	Specific gravity oven-dry weight per green volume	Springwood by volume, per cent	Growth rate, rings per inch	Springwood	Summerwood	Radial, microns	Tangential, microns	Radial, microns	Tangential, microns	Radial, microns	Tangential, microns	Radial, microns	Tangential, microns	Radial, microns	Tangential, microns	Radial, microns	Tangential, microns
M-1	12.5	51	2.6	0.505	41	2.9	0.28	0.64	49	46	43	40	3.3	3.3	30	40	17	26	6.6	7.3
M-6	75.0	70	2.2	.411	60	2.5	.28	.66	49	46	43	39	3.3	3.6	32	40	19	25	6.4	7.4
M-8	100.0	85	2.1	.369	80	2.2	.29	.63	47	43	40	37	3.1	3.0	29	38	18	24	5.7	6.9
JJ-2	20.0	44	11.4	.577	40	10.0	.29	.78	50	46	44	39	3.1	3.5	28	44	14	22	6.8	11.0
JJ-8	80.0	57	9.1	.479	62	12.0	.25	.78	52	46	47	41	2.7	2.7	26	45	11	21	7.5	12.0
JJ-10	100.0	66	7.4	.440	72	9.6	.25	.66	52	48	46	42	3.1	3.1	25	43	14	25	5.3	9.2
J-2	33.4	64	2.7	.460	54	2.5	.28	.68	44	46	36	37	4.1	4.3	34	41	17	21	8.7	9.9
J-4	50.0	65	2.1	.381	60	1.8	.28	.49	49	46	43	40	3.0	3.1	38	48	26	33	5.8	7.4
J-6	86.1	76	2.1	.419	72	2.4	.34	.76	44	42	37	35	3.4	3.7	34	45	18	25	7.8	10.0
K-4	80.0	80	1.9	.347	81	2.4	.26	.67	48	40	42	34	3.1	2.9	31	37	17	21	7.0	7.8
Spruce	....	..	21.1	....	82	24.0	——.39——		32	33	27	28	2.6	2.7	18	32	7	19	5.7	6.5

[1] The letter indicates the tree, the numeral indicates number of the 4-foot log from the butt cut. Discs were cut from the top ends of the logs.
[2] Based on total merchantable length as 100 per cent.
[3] Average for entire disc.
[4] Average for ½-inch cubes cut from disc at a distance of about two-thirds of the radius from the center.
[5] Each value is an arithmetical average of approximately 800 measurements.

age 2.4). The intercepts of these lines at 0 per cent and 100 per cent springwood content, respectively, have been determined by extrapolation. The following inferences may be drawn:

(1) Since the average lines of the two growth-rate classes approach each other at high springwood content, it seems probable that the average specific gravity of the springwood and, presumably, the average cross-sectional fiber dimensions in the two groups is nearly the same.
(2) Since the average lines of the two growth-rate classes diverge at high summerwood content and the fast growth line lies lower in the graph, it appears probable that the fast-growth summerwood averages lower in specific gravity (hence, large fibers or thinner-walled fibers, or both) than the slow-growth summerwood.
(3) For a definite springwood percentage in a given growth-rate class, considerable deviation of the special gravity in individual discs from the average value is evident, especially with the rapid-growth wood, indicating a variation in cross-sectional dimensions. The appearance of the wood to the naked eye may give little clue to these relationships, and low density and high density discs are sometimes strikingly similar in appearance as is shown in Fig. 2.

As a check on point (3) above, fiber measurements were made with two rapid-growth logs, J-2 (high density) and I-4 (low density) of nearly equal springwood content. Table I shows that in J-2 both springwood and summerwood had thicker-walled fibers than in I-4 as well as having smaller outside dimensions. However, these results appeared somewhat questionable when, upon examination of the discs of wood, I-4 was found to have a much less distinct line of demarcation between the springwood and summerwood and hence a larger amount of transition-wood fibers than J-2 and, further, was suspected of containing mild compression wood. Therefore, measurements were made of the fibers from another pair of discs, L-6 and K-4, which, as shown in Fig. 2 were very similar in appearance, and had no such discernible differences as the other two. These measurements showed a high density disc, L-6, to be distinctly thicker-walled in both the springwood and the summerwood as compared with K-4, the lower density disc and confirmed the measurements of J-2 and I-4.

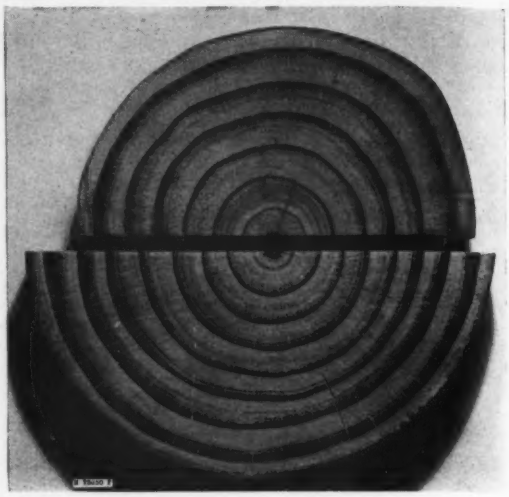

FIG. 2.

Transverse Sections of Loblolly Pine Discs with Approximately Equal Springwood Content but Different Specific Gravity. Smaller Disc (K-4), Specific Gravity 0.347. Larger Disc (L-6), Specific Gravity 0.419.

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(5) *Paper Trade J.* 105, no. 20: 39 (Nov. 11, 1937); *Tech. Assoc. Papers*, 21: 458-465 (1938).
(6) *Paper Trade J.* 107, no. 4: 37 (July 28, 1938); *Tech. Assoc. Papers*, 21: 264-267 (1938).
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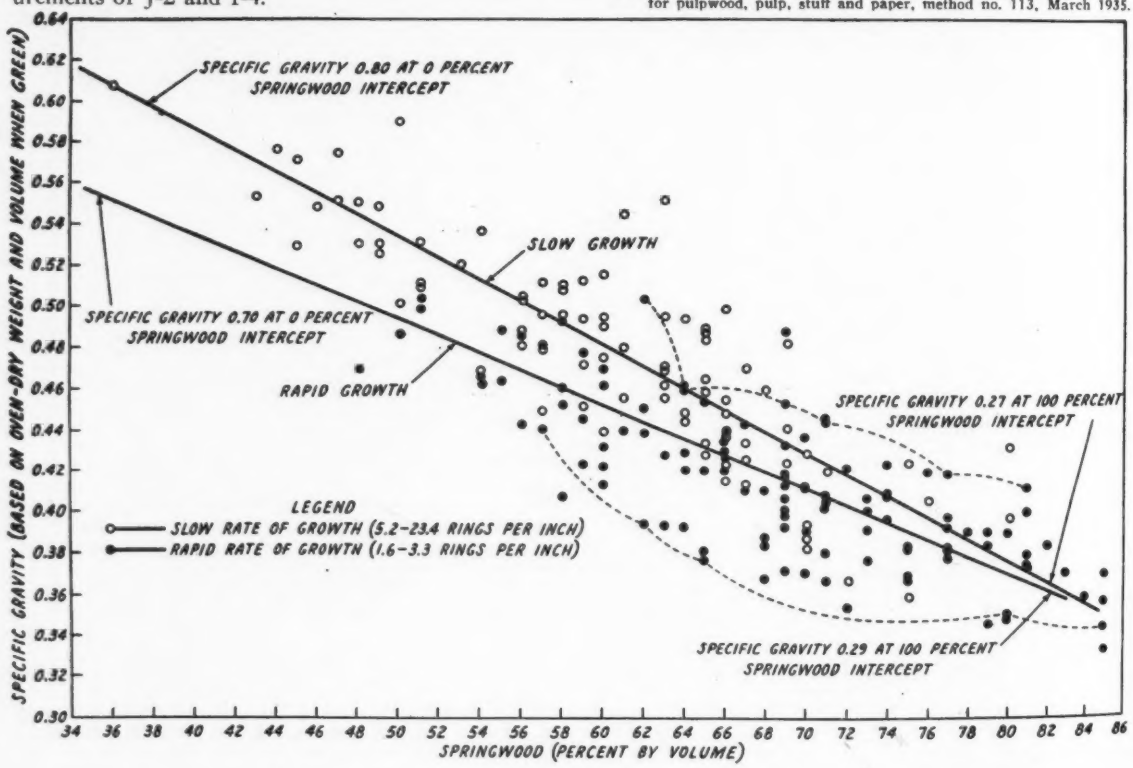
SPECIFIC GRAVITY 0.80 AT 0 PERCENT SPRINGWOOD INTERCEPT
SLOW GROWTH
SPECIFIC GRAVITY 0.70 AT 0 PERCENT SPRINGWOOD INTERCEPT
RAPID GROWTH
SPECIFIC GRAVITY 0.27 AT 100 PERCENT SPRINGWOOD INTERCEPT
SPECIFIC GRAVITY 0.29 AT 100 PERCENT SPRINGWOOD INTERCEPT
LEGEND
SLOW RATE OF GROWTH (5.2-23.4 RINGS PER INCH)
RAPID RATE OF GROWTH (1.6-3.3 RINGS PER INCH)
SPECIFIC GRAVITY (BASED ON OVEN-DRY WEIGHT AND VOLUME WHEN GREEN)
SPRINGWOOD (PERCENT BY VOLUME)
0.64 0.62 0.60 0.58 0.56 0.54 0.52 0.50 0.48 0.46 0.44 0.42 0.40 0.38 0.36 0.34 0.32 0.30
34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86

FIG. 1.

Relation of Specific Gravity to Springwood Content in Loblolly Pine, Shipment 1459

Imports of Paper and Paper Stock

Giving Manifests of New York, Boston, Philadelphia and Other Ports of Newsprint, Wrapping, Writing, Coated, Blotting, Tissue, Strawboard, Wallboard, Cigarette Papers, Sulphite, Kraft and Ground Wood Pulp.

NEW YORK IMPORTS

WEEK ENDING OCTOBER 7, 1939

SUMMARY

Cigarette paper .....299 cs.
Wall paper .....391 rolls, 32 bxs.
Wall board .....344 bdls.
Newsprint .....3,282 rolls
Wrapping paper .....376 rolls, 20 cs.
Filter paper .....5 cs.
Surface coated paper .....130 cs.
Surface baryta coated paper.....61 cs.
Basic paper .....22 cs.
Colored paper .....9 cs.
Tissue paper .....77 cs.
Paper board .....15 cs.
Paper tubes .....260 bxs., 118 cs.
Miscellaneous paper .....1,892 pkgs., 30 rolls, 12 cs.

CIGARETTE PAPER

Van Oppen & Co., *Excalibur,* Marsailles, 73 cs.
Champagne Paper Corp., ——, Havre, 226 cs.

WALL PAPER

S. K. Lonegren, *Gripsholm,* Gothenburg, 32 bxs.
——, *Gripsholm,* Gothenburg, 391 rolls.

WALL BOARD

A. H. Morner, *Vasaholm,* Wifstavarf, 344 bdls.

NEWSPRINT

Parsons & Whittemore, Inc., *Gripsholm,* Gothenburg, 153 rolls.
Nolan Bowmall & Co., Inc., *Gripsholm,* Gothenburg, 75 rolls.
Perkins Goodwin & Co., *Gripsholm,* Gothenburg, 244 rolls.
Greenwich Paper Co., *Gripsholm,* Gothenburg, 90 rolls.
Clinton Paper Co., *Vasaholm,* Gothenburg, 364 rolls.
Gilman Paper Co., *Vasaholm,* Gothenburg, 237 rolls.
Boston Paper Board Co., *Vasaholm,* Gothenburg, 146 rolls.
Parsons & Whittemore, Inc., *Rydboholm,* Gothenburg, 143 rolls.
Perkins Goodwin & Co., *Rydboholm,* Gothenburg, 28 rolls.
Nolan Bowmall & Co., Inc., *Rydboholm,* Gothenburg, 5 rolls.
——, *Rydboholm,* Gothenburg, 908 rolls.
National Pulp & Paper Co., *Bergensfjord,* Oslo, 889 rolls.

WRAPPING PAPER

Blauvelt Wiley Paper Manfg. Co., *Gripsholm,* Gothenburg, 63 rolls.
Wilkinson Grey & Co., *Gripsholm,* Gothenburg, 113 rolls.
The Borregaard Co., Inc., *Gripsholm,* Gothenburg, 50 rolls.
F. L. Kramer & Co., *Gripsholm,* Gothenburg, 150 rolls.
F. C. Strype, *Black Osprey,* Antwerp, 20 cs.

FILTER PAPER

C. Schleicher & Schull Co., Inc., *Black Osprey,* Rotterdam, 5 cs.

SURFACE COATED PAPER

Gevaert Co. of America, *Black Osprey,* Antwerp, 63 cs.
Gevaert Co. of America, *Pennland,* Antwerp, 67 cs.

SURFACE BARYTA COATED PAPER

Dingelstedt & Co., *Pennland,* Antwerp, 61 cs.

BASIC PAPER

R. Wilson Paper Corp., *Black Osprey,* Antwerp, 22 cs.

COLORED PAPER

J. W. Hampton Jr., & Co., Inc., *Black Osprey,* Antwerp, 9 cs.

TISSUE PAPER

P. Schweitzer, Inc., *Excalibur,* Genoa, 77 cs.

PAPER BOARD

J. P. Heffernan Paper Co., *Black Osprey,* Antwerp, 15 cs.

PAPER TUBES

——, *Black Osprey,* Antwerp, 260 bxs., 118 cs.

MISCELLANEOUS PAPER

The Borregaard Co., Inc., *Gripsholm,* Gothenburg, 30 rolls, 1892 pkgs.
——, *N. Amsterdam,* Rotterdam, 6 cs.
Coty, Inc., ——, Havre, 5 cs.
M. Schweitzer, *Pennland,* Antwerp, 1 cs.

RAGS, BAGGINGS, ETC,

W. Steck & Co., *Exminster,* Alexandria, 151 bls. bagging.
Darmstadt Scott & Courtney, *Black Osprey,* Antwerp, 519 bls. bagging.
R. Blank, *Black Osprey,* Antwerp, 137 bls. rags.
J. T. Flannery, *Black Osprey,* Antwerp, 9 bls. rags.
T. D. Downing & Co., *Black Osprey,* Rotterdam, 16 bls. rags.
Irving Trust Co., *Black Osprey,* Rotterdam, 3 bls. rags.
——, *Oriente,* Havana, 37 bls. rags.

CASEIN

G. H. Hammond Co., *Uruguayo,* Buenos Ayres, 406 bags.
American & British Chemical Supplies, *Black Osprey,* Antwerp, 312 bags.

WOOD PULP

M. Sone, *Exchester,* Constanza, 625 bls. bleached sulphite, 125 tons.
M. Sone, *Gripsholm,* Gothenburg, 600 bls. woodpulp.
Stora Kopparberg Corp., *Gripsholm,* Gothenburg, 1 bl. woodpulp.
Salwen Paper Co., *Gripsholm,* Gothenburg, 9 bls. woodpulp.
D. M. Hicks, Inc., *Gripsholm,* Gothenburg, 150 bls. sulphite.
Bulkley Dunton Pulp Co., Inc., *Gripsholm,* ——, 900 bls. sulphite.
Central Hanover Bank Trust Co., *Vasaholm,* Wifstavarf, 3000 bls. woodpulp.
Stora Kopparberg Corp., *Vasaholm,* Gothenburg, 715 bls. woodpulp.
E. M. Sergeant Pulp & Chemical Co., *Vasaholm,* Gothenburg, 3252 bls. woodpulp.
D. M. Hicks, Inc., *Rydboholm,* Gothenburg, 450 bls. dry sulphite.
E. M. Sergeant Pulp & Chemical Co., *Bergensfjord,* Oslo, 125 bls. bleached sulphite, 25 tons.
The Borregaard Co., Inc., *Bergensfjord,* Oslo, 750 bls. unbleached sulphite, 137 tons.

BOSTON IMPORTS

WEEK ENDING OCTOBER 7, 1939

Stone & Downer Co., *Black Osprey,* Antwerp, 52 rolls wrapping paper.
Irving Trust Co., *Black Osprey,* Antwerp, 52 bls. rags.
D. C. Andrews & Co., *Black Osprey,* Antwerp, 14 bls. cotton waste.
Elliott Addressing Machine Co., *Tai Ping,* Yokohama, 5 cs. paper.

PHILADELPHIA IMPORTS

WEEK ENDING OCTOBER 7, 1939

Bank of Greece, *Exchester,* Piraeus, 455 bls. rags.
——, *Mormacwren,* Bergen, 88 rolls paper.
Castle & Overton, Inc., *Buenos Ayres,* Buenos Ayres, 39 bls. rags.

BALTIMORE IMPORTS

WEEK ENDING OCTOBER 7, 1939

Nolan Bowmall & Co., Inc., *Exchester*, Constanza, 175 bls. unbleached sulphite, 35 tons.

LOS ANGELES IMPORTS

WEEK ENDING OCTOBER 7, 1939

——, *Nordstjernen*, Norrkoping, 1125 rolls newsprint paper.
——, *Nordstjernen*, Stockholm, 4500 bls. sulphite pulp.
——, *Nordstjernen*, Gothenburg, 255 rolls kraft paper.
——, *Tatuta Maru*, Kobe, 1 cs. surface coated paper.

To Represent T. B. Wood's Sons Co.

Henry D. Clark with offices at 94 Plane street, Newark, N. J., has been appointed district representative for the T. B. Wood's Sons Company line of power transmission machinery. The Wood Company has established this point as its warehouse to serve the distributors in northern Jersey and the New York metropolitan area. Large stocks are being accumulated there for this purpose. Mr. Clark has long been connected with the T. B. Wood's Sons Company and is well and favorably known in the territory he covers.

The Louisville Mill Supply Company, 1012 E. Main street, Louisville, Ky., has been appointed distributors for the T. B. Wood's Sons Company line of power transmission machinery.

The M. D. Larkin Company, 115-121 E. Third street, Dayton, Ohio, has been appointed distributors in the Dayton area for the T. B. Wood's Sons Company line of power transmission machinery.

Schuylkill Elects Officers

[FROM OUR REGULAR CORRESPONDENT]

PHILADELPHIA, Pa., October 9, 1939—At the recent meeting of Schuylkill Paper Company the following officers were elected: Fred Balch was re-elected president and treasurer; Howard Scatterthwaite was elected vice-president, and Clyde Cobaugh, secretary. The board is made up of Fred Balch, James Andrews, Jr., and William Lyford who is in charge of the warehouses. David Thomas heads the force of salesmen, the other members being Charles Robinson, Thomas McIntire, Robert Craig and Walter Lupton.

Hearing on Argentine Reciprocity

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., October 11, 1939—The Committee for Reciprocity Information will hold hearings on October 16 and 17, in connection with the trade agreement with Argentina.

Among the appearances so far listed of interest to the paper industry are included: on casein: Holley R. Cantin, the Martin Cantin Company, Saugerties, N. Y.; H. C. Bradford, Rex Paper Company, Kalamazoo, Michigan; R. McCann, American Dry Milk Institute, Chicago; on quebracho extract: Champion Paper and Fiber Company, Canton, N. C.; and Kraft paper: Southern Kraft Corporation, New York.

Now National Starch Products

For some years, officials of the National Adhesives Corporation have realized that the name "Adhesives" has not been fully descriptive of its products and has changed its name to National Starch Products, Inc. The majority of its pastes and glues are manufactured from starches processed in its own refinery at Dunellen, N. J. In recent years the company has become an important factor in the refining and processing of starches for foods, confectionery, textiles, and paper, as well as in the manufacture of lacquers, thermoplastics, and similar materials.

The management of National Starch Products, Inc. will be identical with that of National Adhesives Corporation, and executive offices will continue at 820 Greenwich Street, New York.

The company now announces the purchase of the plant of the Piel Brothers Starch Company of Indianapolis, which will also be operated as a division of National Starch Products, Inc. The Piel Brothers Starch Company has for 72 years been an important manufacturer of corn starch and related products. Present plans are to introduce into this plant, in the near future, patented processes and machinery developed by National Adhesives Corporation, and to produce some entirely new types of corn gums, in addition to the standard corn materials regularly manufactured. The Dunellen refinery will continue to manufacture high-grade tapioca and sago products.

New De-Inking Process

By a formula developed by A. D. BeVier, paper can be reclaimed, it is said, at a chemical cost of $2.25 per ton, in less than one half hour. As a result of the short time required for this process, the addition of new pulp to the reclaimed pulp is not necessary, inasmuch as the percentage of fiber destruction is negligible.

Perhaps as interesting as the process itself, is the history of its discovery. According to report it is stated that "Mr. BeVier read a newspaper article in 1918 which mentioned that hundreds of thousands of dollars had been spent in trying to perfect a reclaiming process. Becoming interested, the inventor, without any experience or knowledge of the paper business, but with a desire to satisfy a crying need of the paper industry, as well as a desire to do something by himself, spent almost twenty years experimenting and finally found the correct process. He uses a patented chemical formula and a patented beater."

Mr. BeVier has leased his patents to the Controlled Heat Equipment Company, who have not as yet mapped any definite program for the distribution of either the process or the completed product.

R. S. Kellogg Entertains

R. S. Kellogg, secretary of the Newsprint Service Bureau, 342 Madison avenue, New York, and Mrs. Kellogg, will have as their luncheon guests on September 13 two well known Japanese newsprint executives, Ginjiro Fujihara, president of Oji Seishi Kabushiki Kaisha, of Tokyo, Japan, and his assistant Y. Fukukita. This concern, which is a combination of many producing plants, manufactures about 80 per cent of the machine made paper produced in Japan. The Japanese paper men are returning to Japan after a business trip in Europe and in this country.

PULP

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GROUNDWOOD
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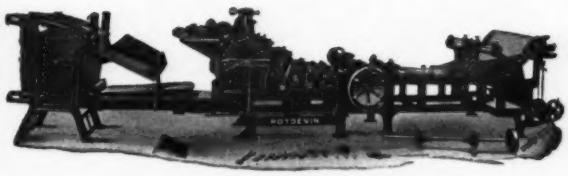
Sulphite & Soda Mill: Cornwall, Ont. *Groundwood Mill:* Crabtree Mills, P.Q. *Kraft Mill:* Windsor Mills, P.Q.

1/16 — 1/8 — 1/4 — 1/3 — BBL.

PAPER SACKS



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New York Market Review

Office of the PAPER TRADE JOURNAL,
Wednesday, October 11, 1939.

As the steady advance in general business activity continues considerable comment is heard in the paper trade relating to speculative buying. Purchasing for the future has occurred in varying degree whenever an unusual situation of an emergency character has arisen in international and domestic trade. Although it now appears that the first scramble to book orders has subsided to some extent, forward buying of nearly all paper and paper products continues. This volume is quite generally viewed by some leaders in the trade as in excess of current needs and may, therefore, be termed speculative buying in anticipation of a large future demand and possible scarcity of goods. It also appears that a large part of the strong upward movement in general business is backed by actual needs and reports from the trade of increasing consumer demand supports the opinion that a sound business recovery is in progress.

The index of general business activity advanced to 102.0 per cent for the week ended September 30, from 101.1 per cent for the preceding week, compared with 84.1 per cent for the like period last year. The production ratio of 201 mills for the week ended September 30 rose to an estimated 94.6 per cent, compared with 81.1 per cent for the corresponding week last year, and with 79.2 per cent in 1937. Paper board production for the week ended September 30 was 82.0 per cent, compared with 69.0 per cent last year at the same date, and with 71.0 per cent for the corresponding week in 1937.

The newsprint market reports no change during the current week. Consumption is slowly gaining as advertising linage continues to show only slight advances.

Production of practically all paper and paper products is now reported at capacity. Reports from many manufacturers' representatives, jobbers, and general paper merchants, indicate that consumer demand is improving in all lines. Kraft paper is very active with orders running well ahead of current production. All mills in the South are reported to be operating at capacity.

Paper board production and shipments continue at a high level. Prices have been substantially revised upward on two recent occasions. A good part of the activity in paper board, however, is based upon current demand which has been steadily improving since last May.

Mechanical Pulp

The consumption of mechanical pulp continues at a high level. Prices of all grades of foreign and domestic pulp are firm. No important changes in quotations have been reported for the current week.

Chemical Pulp

In the opinion of a leading dealer in imported and domestic pulp, the foreign pulp situation is still jittery and the result is reflected in this market to some extent. The result of these conditions is, of course, that no one can tell what is going to occur from day to day. Many shrewd buyers of imported pulp went far beyond their anticipated requirements because of the low prices prevailing at the time of purchases. Some of them are now reaping the harvest by reselling large quantities at a profit.

The prevailing opinion at present is that there has been some setback in the activity of the pulp market but, as yet, there is no discernible basis for determining either its extent or durability but, in the meantime, there is no cause for apprehension that the paper and board mills in this country will be obliged to curtail production because of lack of pulp. However, as hostilities in Europe may not terminate for some time, prices are bound to advance gradually on all kinds of pulp.

Old Rope and Bagging

Prices on old domestic Manila rope are very firm. Some confusion exists in the current market situation and prices are on a nominal basis. The price trend in old bagging continues upward, with foreign No. 1 gunny currently quoted at from 2.25 to 2.50. No other important change has been reported to date.

Rags

All prices on new and old rags are nominal, with no important changes in prices or demand reported for the current week. New No. 1 white shirt cuttings are currently quoted at from 8.00 to 8.25.

Old Waste Paper

Some reductions in prices are reported in some grades of waste paper this week. It now appears that what appeared to be a runaway market in No. 1 mixed and folded news has been checked. Current quotations on white ledger stock are higher at from 1.60 to 1.70, while strictly folded news is lower and currently quoted at from .60 to .75, while corrugated is a little lower and currently quoted at from .75 to .80.

Twine

The twine market is active. Prices are firm and while some quarters of the trade expect higher prices, no important changes have been reported this week.

Lincoln Introduces New Paper

A new grade of paper to be known as "Pattern Service Mimeograph" has just been added to the line of the Lincoln Paper Company, Chicago. A moderately priced, watermarked paper, the new item becomes a companion sheet to "Patten Mimeo-Bond" which has received most favorable attention from buyers. "Service Mimeograph" will be attractively wrapped in cut sizes, a special marketability feature which the company is widely advertising.

J. Andersen & Co.

Selling Agents

21 East 40th Street

New York

CHEMICAL & MECHANICAL PULP

Kraft Pulp

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NENSJÖ CELLULOSA A.-B.
Sprängsvikan, Sweden

Unbleached Sulphite

AKTIESELSKABET GREAKER CELLULOSEFABRIK
Greaker, Norway
BERGVIK OCH ALA NYA AKTIEBOLAG
Söderhamn, Sweden
CELLULOSEFABRIKS A.-G.
Bratislava, Czecho-Slovakia
SVANÖ AKTIEBOLAG
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Bleached Sulphite

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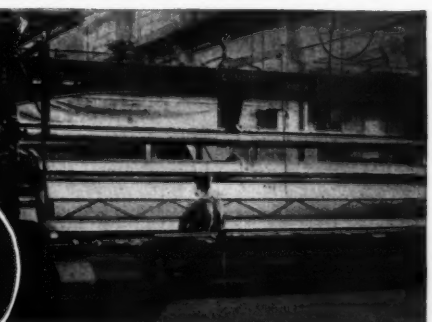

CAMERON MACHINE COMPANY
61 Poplar St. BROOKLYN, N.Y.

Miscellaneous Markets

Office of the PAPER TRADE JOURNAL,
Wednesday, October 11, 1939.

BLANC FIXE—Quotations on blanc fixe are firm under a good demand, with no change in prices reported for the current week. The pulp is currently quoted at from $42.50 to $45 per ton, in bulk; the powder is offered at from 3½ to 3¾ cents per pound, in barrels, at works.

BLEACHING POWDER—Prices on bleaching powder are firm and demand is reported steady for the current week. Bleaching powder is currently quoted at from $2 to $2.85 per 100 pounds, in drums, at works.

CASEIN—Quotations on casein are firm under an active demand. Standard domestic casein, 20-30 mesh, is currently quoted at 20 cents per pound; 80-100 mesh, at 20½ cents per pound. All prices in bags, car lot quantities. Prices on Argentine and French casein are nominal.

CAUSTIC SODA—Prices on caustic soda are firm under a good demand. Solid caustic soda is currently quoted at from $2.30 to $2.40 per 100 pounds; flake and ground at from $2.70 to $2.95 per 100 pounds, in drums, at works.

CHINA CLAY—Quotations on china clay continue firm under a good demand. Domestic filler clay is currently quoted at from $7 to $15 per ton; coating clay at from $11 to $22 per ton, at mines. Imported clay is offered at from $13 to $25 per ton, ship side.

CHLORINE—Quotations on chlorine continue firm under an active demand, with prevailing prices unchanged. Chlorine is quoted at $1.75 per 100 pounds, in single-unit tank cars, f.o.b., works.

ROSIN—The rosin market is reported as firm. Current quotations on several grades are lower this week. "G" gum rosin is quoted at $5.35 per 280 pounds, gross weight, in barrels, at Savannah. "FE" wood rosin is quoted at $5 per 280 pounds, gross weight, in barrels, New York. Seventy per cent gum rosin size is offered at $2.86 per 100 pounds, f.o.b., shipping point.

SALT CAKE—Quotations on salt cake are firm under an active demand. Current quotations range at from $15 to $19 per ton; chrome salt cake at from $14 to $15 per ton, f.o.b., shipping point. Quotations on imported salt cake are nominal.

SODA ASH—Demand continues active on soda ash and prices are firm and unchanged this week. Quotations on soda ash in car lots, at works, per 100 pounds, are as follows: in bulk, $.90; in bags, $1.10; and in barrels, $1.35.

STARCH—Demand for corn starch continues good and prices are firm, Globe pearl is currently quoted at $2.65 per 100 pounds; special paper starch at $2.75 per 100 pounds; all prices in bags, car lots, f.o.b., Chicago.

SULPHATE OF ALUMINA—Quotations on sulphate of alumina are firm and conform to market prevailing prices. The commercial grades are currently quoted at $1.15; iron free at $1.30 per 100 pounds, in bags, car lot quantities, f.o.b., works.

SULPHUR—Prices on sulphur continue firm and unchanged at prevailing market quotations. Annual contracts are quoted at $16 per long ton, f.o.b., mines. Spot and nearby car lots are offered at $10 per ton.

TALC—Quotations on talc continue firm under a good demand and conform to prevailing market levels. Domestic talc is currently offered at from $15 to $18 per ton, Eastern mines. Prices on imported talc are nominal.

Market Quotations

Paper

(Delivered New York)

News, per ton—			
Roll, contract	$50.00	●	—
Sheets	58.00	●	—
Kraft—per cwt.—Delivered Zone A			
No. 1 Northern	$4.75	@	$5.25
Superstandard	4.25	@	4.75
Northern Standard Wrapping	4.00	●	—
Standard Wrapping	3.62½	@	—
Tissues—Per Ream—Carlots			
White No. 1	.87½	@	—
White No. 1 M. G.	.85	@	—
White No. 1½	.62½	@	—
White No. 2	.60	@	—
Anti-Tarnish M. G.	.75	@	—
Colored	.87½	@	—
Kraft	.75	@	—
Manila	.60	●	—
Unbl. Toilet, 1 M.	3.25	@	—
Bleached Toilet	5.26	●	—
Paper Towels, Per Case—			
Unbleached, Jr.	1.80	@	—
Bleached, Jr.	3.10	@	—
Manila—per cwt.—C. l. f. a.			
No. 1 Jute	7.75	●	9.75
No. 1 Manila Wrapping, 35 lb.	5.00	●	—
No. 2 Manila Wrapping, 35 lb.	4.75	●	—
Boards, per ton—			
News	45.00	@	—
Chip	45.00	@	—
Sgl. Mla. Ll. Chip	57.50	@	—
Jute Lined Chip	57.50	@	—
White Pat. Coated	70.00	@	—
Kraft Liners	45.00	@	47.50
Binders Boards	71.00	@	77.00

The following are representative of distributors' resale prices:

Rag Content Bonds and Ledgers—White, Assorted Items, Delivered in Zone 1:

	Bonds	Ledgers
100% Rag Ext. No. 1	$39.10@$46.00	$40.25@$47.25
100% Rag	31.05@ 36.50	32.20@ 37.75
85% Rag	.....	29.90@ 35.00
75% Rag	23.60@ 27.75	24.75@ 29.00
65% Rag	.....	21.65@ 26.25
50% Rag	17.55@ 21.50	18.70@ 22.75
25% Rag	14.65@ 17.75	15.80@ 19.25

Colors at $1.00 cwt. extra.

Sulphite Bonds and Ledgers—White, Assorted Items, Delivered in Zone 1:

	Bonds	Ledgers
No. 1	$8.60@$10.50	$9.75@$12.00
No. 2	7.70@ 9.50	8.90@ 10.75
No. 3	6.75@ 8.25	7.90@ 10.00
No. 4	7.00@ 8.50	8.20@ 10.00

Colors $1.00 cwt. extra.

Free Sheet Book Papers—White, Cased Paper, Delivered in Zone 1:

No. 1 Glossy Coated	$11.30@$12.75
No. 2 Glossy Coated	9.70@ 11.00
No. 3 Glossy Coated	8.60@ 10.00
No. 4 Glossy Coated	8.05@ 9.25
No. 1 Antique (watermarked)	8.05@ 9.25
No. 2 Offset	7.45@ 8.50
A Grade E. F.	7.20@ 8.25
A Grade S. & S. C.	7.45@ 8.50
B Grade E. F.	6.65@ 7.75
B Grade S. & S. C.	6.90@ 8.00
C Grade E. F.	6.40@ 7.50
C Grade S. & S. C.	6.65@ 7.75
D Grade E. F.	6.10@ 7.00
D Grade S. & S. C.	6.35@ 7.25

Ivory & India at $.50 cwt. extra

Mechanical Pulp

(On Dock, Atlantic Ports)

No. 1 Imported—			
Moist	30.00	@	35.00
Dry	30.00	@	35.00
(Delivered)			
No. 1 Domestic and Canadian	38.00	@	40.00

Chemical Pulp

(On Dock, Atlantic, Gulf and West Coast Ports)

Bleached Sulphite (Domestic and Foreign)—			
Prime Bleached Sulphite	2.50	@	3.00
Prime Qualities—			
Easy-Bleaching Sulphite	2.20	@	2.35
Strong Unbleached Sulphite	2.10	@	2.30
(On Dock, Atlantic Ports)			
Kraft Bleached	2.50	@	3.25
Kraft Light & Strong	1.65	@	1.80
Kraft No. 1	1.60	@	1.75
(F. o. b. Pulp Mill)			
Kraft Domestic	1.60	@	2.00
(Delivered)			
Soda Bleached	2.55	@	—

Add 60 cents per short ton, dock charges for Albany; $2.50 for Lake Ports East and $3.50 for Lake Ports West of Mackinac Straits. Also add extra freight charges and war insurance to all quotations on imported pulp.

Domestic Rags

New Rags

All prices nominal.

(Prices to Mill f. o. b. N. Y.)

Shirt Cuttings—			
New White, No. 1	8.00	@	8.25
Silesias No. 1	4.50	●	4.75
New Unbleached	8.00	@	8.25
Blue Overall	4.90	●	5.00
Fancy	1.75	●	2.00
Washables	1.50	●	1.60
Mixed Khaki Cuttings	2.25	●	2.30
O. D. Khaki Cuttings	3.25	●	3.40

Old Rags

White, No. 1—			
Repacked	2.90	●	3.10
Miscellaneous	2.10	●	2.35
White, No. 2—			
Repacked	1.50	●	1.60
Miscellaneous	1.25	●	1.40
Thirds and Blues—			
Repacked	1.30	●	1.40
Miscellaneous	1.15	●	1.20
Roofing Rags—			
No. 1	1.75	@	2.00
No. 2	1.50	@	1.60
No. 3 (bagging)	1.50	@	1.60
No. 4	.60	●	.65
No. 5A	.60	●	.65

Foreign Rags

All prices nominal

New Rags

New Dark Cuttings	2.25	●	2.40
New Mixed Cuttings	2.00	●	2.20
New Light Silesias	5.50	●	5.75
Light Flannelettes	5.50	●	5.75
New White Cuttings	7.00	●	7.50
New Light Oxford	4.00	●	4.50
New Light Prints	3.00	●	3.25

Old Rags

No. 1 White Linens	7.50	●	8.50
No. 2 White Linens	6.50	●	7.50
No. 3 White Linens	4.50	●	—

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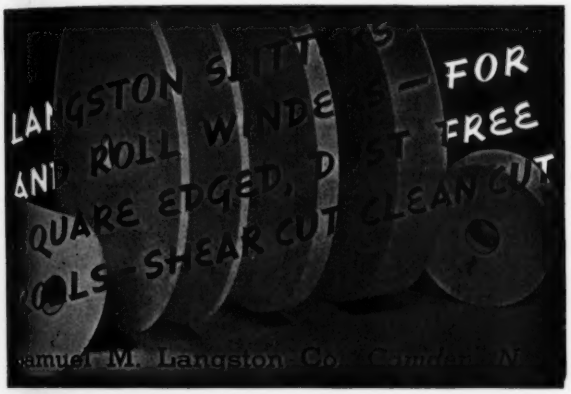

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$10.50
FULLY GUARANTEED

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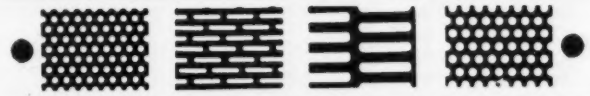
WALTHAM, MASS.

SCREENS of Perforated Metal



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Paper Mill Machinery

THE CANNARD COMPANY
Paper Making & Paper Finishing Machinery
Winders, Wrappers, Banders and Printers for various types of packages.
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Tide Water Division
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STOCK PREPARATION EQUIPMENT
Dilts
MACHINE WORKS Inc. FULTON, N.Y.

No. 4 White Linens.	2.25	@	3.25
No. 1 White Cotton.	4.25	@	4.75
No. 2 White Cotton.	3.25	@	3.75
No. 3 White Cotton.	2.50	@	3.00
No. 4 White Cotton.	1.90	@	2.20
Extra Light Prints..	2.00	@	2.40
Ord. Light Prints...	1.75	@	2.15
Med. Light Prints...	1.55	@	1.95
Dutch Blue Cottons.	2.25	@	2.50
French Blue Linens..	3.00	@	—
Checks and Blues...	2.00	@	—
Linsey Garments....	1.90	@	2.00
Dark Cottons.....	1.50	@	1.60
Old Shopperies.....	1.30	@	1.45
New Shopperies.....	1.45	@	1.50
French Blues.....	2.25	@	2.50

Old Rope and Bagging

All prices nominal

(Prices to Mill, f. o. b. N. Y.)

Gunny No. 1—			
Foreign	2.25	@	2.50
Domestic	1.50	@	1.60
Wool Tares, light...	1.60	@	1.70
Wool Tares, heavy..	1.80	@	1.90
Bright Bagging.....	1.50	@	1.60
Manila Rope—			
Foreign 2.60		@	2.75
Domestic	2.75	@	3.00
Jute Threads.....	3.00	@	3.25
Sisal Strings	1.50	@	1.60
Mixed Strings....	.55	@	.60

Old Waste Papers

(F. o. b. New York)

Shavings—			
White Envelope Cuttings	2.30	@	2.40
Ordinary Hard White No. 1....	1.90	@	2.00
Soft White No. 1..	1.60	@	1.75
Soft White Extra..	2.25	@	2.40
Flat Stock—			
Stitchless	.80	@	.85
Overissue Mag.....	1.15	@	1.25
Solid Flat Book...	1.00	@	1.10
Crumbled No. 1....	.40	@	.45
Ledger Stock White.	1.60	@	1.70
Ledger Stock Colored	1.05	@	1.15
Manila—			
New Env. Cut....	1.40	@	1.50
New Cuttings.....	1.00	@	1.20
Old Kraft Machine—			
Compressed bales..	1.05	@	1.15
News—			
No. 1 White News	1.25	@	1.30
Strictly Overissue..	.60	@	.65
Strictly Folded....	.60	@	.65
Corrugated	.75	@	.80
No. 1 Mixed Paper..	.55	@	.60

Twines

(F. o. b. Mill)

(Soft Fiber)

Coarse Polished—			
India	.18	@	—
White Hemp.....	.18	@	—
Fine Polished—			
Fine India.....	.23	@	—
Unpolished—			
Box	.14¼	@	—
Paper Makers.....	.14½	@	—
Tube Rope.....	.15	@	—
Wall Paper.....	.14¾	@	—
Wrapping	.17	@	—
Soft Fiber Rope...	.16¼	@	—
Cotton	.21	@	—

(Hard Fiber)

Medium Java.....	.18	@	—
Mex. Sisal.....	.14	@	—
Manila	.24	@	—
Domestic	4.00	@	4.50
Sisal Rope.....	2.00	@	—
Mixed Rope.....	.60	@	.80
Transmission Rope..	2.50	@	3.00
Soft Jute Rope.....	2.25	@	2.40
Jute Carpet Threads.	1.25	@	1.50
Gunny Bagging—			
Foreign .....(nominal)			
Domestic	1.90	@	2.00
Bleachery Burlap....	3.25	@	3.50
Scrap Burlap—			
Foreign .....(nominal)			
Domestic	1.62½	@	1.75
Scrap Sisal.....	1.70	@	1.80
Scrap Sisal for Shredding	2.00	@	2.25
Wool Tares, Heavy..	1.40	@	1.50
New Burlap Cuttings	2.75	@	3.00
Aust. Wool Pouches.	2.50	@	3.00
Heavy Baling Bagging	2.00	@	2.25
Paper Mill Bagging..	1.25	@	1.50
No. 2 Bagging.....	1.25	@	1.30

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—			
New Light Prints...	.03¼	@	.03½
New White No. 1....	.0675	@	.0690
New Light Flannelettes	.05	@	—
Silesias No. 1.....	.04	@	.04¼
New Black Silesias..	.03½	@	.03¾
Soft Unbleached.....	7.50	@	8.00
Blue Cheviots.....	.05½	@	.06
Fancy	.02	@	.02½
Washable	.02	@	.02½
Cottons—According to grades—			
Blue Overalls.....	.05¼	@	.05½
New Black, soft...	.03¼	@	.04
Khaki Cuttings.....	.02½	@	.03
O. D. Khaki.....	.03	@	.03¼
Corduroy	.02¼	@	.03
New Canvas.....	.06¾	@	.07¼
B. V. D. Cuttings...	.07	@	.07½

Domestic Rags (Old)

(F. o. b. Boston)

Canvas	.04¼	@	—
White No. 1—			
Repacked	—	@	2.75
Miscellaneous	2.50	@	2.75
White No. 2—			
Repacked	1.90	@	2.00
Miscellaneous	2.00	@	2.25
Twos and Blues.....	2.25	@	2.50
Old Blue Overalls...	1.60	@	2.00
Thirds and Blues—			
Repacked	2.00	@	2.25
Miscellaneous	1.50	@	1.60
Black Stockings.....	4.00	@	4.25
Roofing Stock—			
No. 1.....	1.75	@	2.00
No. 2.....	1.60	@	1.65
No. 3.....	1.00	@	1.25

Foreign Rags

(F. o. b. Boston)

Dark Cottons.....(nominal)	
Dutch Blues.....(nominal)	
New Checks and Blues(nominal)	
Old Fustians.....(nominal)	
Old Linsey Garments.(nominal)	
New Silesias.....(nominal)	

PHILADELPHIA

Domestic Rags (New)

(Price to Mill, f. o. b. Phil.)

Shirt Cuttings—			
New White No. 1.	.07¼	@	.07½
New White, No. 2.	.04	@	.04½
Light Silesias.....	—	@	.04½
Silesias, No. 1....	—	@	.04½
Black Silesias, soft	—	@	.03¾
New Unbleached..	.05½	@	.06
Washable, No. 1..	—	@	.04
Blue Overall.....	—	@	.05
Cottons—According to grades—			
Washable No. 2...	—	@	.02
New Blue.....	—	@	.02
Fancy Percales....	—	@	.03
New Black Soft...	—	@	.04
New Light Seconds	.04½	@	.05
New Dark Seconds	—	@	1.50
Khaki Cuttings—			
No. 1 O. D.....	.03½	@	.04
No. 2 Mixed.....	.03	@	.03¼
Corduroy	—	@	.02½
New Canvas.....	.05½	@	.06
New Black Mixed.	—	@	03

Domestic Rags (Old)

White No. 1—			
Repacked	3.50	@	4.00
Miscellaneous	2.75	@	3.00
Thirds and Blues—			
Miscellaneous	2.00	@	2.25
Repacked	2.50	@	2.75
Black Stockings (Export)	3.50	@	4.00
Roofing Stock—			
Foreign No. 1.....Nominal			
Domestic No. 1....	1.60	@	1.70
Domestic No. 2....	1.45	@	1.50
Roofing Bagging...	—	@	1.40

Bagging

(F. o. b. Phila.)

Gunny, No. 1—			
Foreign .....Nominal			
Domestic	2.50	@	3.00
Manila Rope.....	—	@	4.50
Sisal Rope.....	1.75	@	2.00
Mixed Rope.....	1.25	@	1.50
Scrap—			
No. 1.....	2.25	@	2.50
No. 2.....	—	@	1.40
Wool Tares, heavy..	3.50	@	3.70
Mixed Strings.....	.75	@	1.00
No. 1 New Light Burlap	3.00	@	3.50
New Burlap Cuttings	2.00	@	2.25

Old Papers

(F. o. b. Phila.)

Shavings—			
No. 1 Hard White	2.25	@	2.30
No. 2 Hard White	1.90	@	2.00
No. 1 Soft White.	1.75	@	1.80
No. 2 Soft White.	1.40	@	1.50
No. 1 Mixed.....	.65	@	.75
Solid Ledger Stock..	1.45	@	1.50
Ledger Stock, white.	1.15	@	1.20
Ledger Stock, colored	.80	@	.90
No. 1 Books, heavy..	.75	@	.80
Manila Cuttings....	1.45	@	1.50
Print Manila	.62½	@	.67½
Container Manila....	.57½	@	.62½
Kraft Paper.....	.75	@	.80
No. 1 Mixed Paper..	.55	@	.65
Straw Board Chip...	—	@	.50
Binders Board Chip..	—	@	.50
Corrugated Board...	.62½	@	.67½
Overissue News.....	.70	@	.75
Old Newspapers.....	.65	@	.70

BOSTON

Old Papers

(F. o. b. Boston)

Shavings—			
No. 1 Hard White	2.25	@	2.50
No. 1 Soft White.	1.85	@	2.15
No. 2 Mixed.....	.75	@	.80
Solid Ledger Books..	1.30	@	—
Overissue Ledger Stock	1.30	@	1.50
Mixed Ledgers.....	.85	@	.90
No. 1 Books, heavy..	.70	@	—
No. 1 Books, light..	.65	@	.75
Crumpled Stitchless Book Stock.....	.55	@	.65
Manila Env. Cuttings	1.70	@	1.85
Manila Envelope Cuttings, Extra Quality	2.20	@	2.25
No. 1 Old Manila...	.80	@	.90
White Blank News..	1.30	@	1.40
No. 1 Kraft.....	1.00	@	1.10
Mixed Papers.....	.52½	@	.55
Print Manila	.70	@	.75
Container Manila....	.60	@	.70
Old Newspapers.....	.60	@	.65
Paper Wool Strings..	.55	@	.60
Overissue News.....	.70	@	.75
Box Board Chips....	.52½	@	.55
Corrugated Boxes....	.75	@	.80
Kraft corrugated boxes	1.00	@	1.05
Screening Wrappers.	.60	@	.70

Bagging

(F. o. b. Boston)

Manila Rope—			
Foreign	4.00	@	—

CHICAGO

Old Papers

(F. o. b. Chicago)

Shavings—			
No. 1 White Envelope Cuttings....	1.80	@	1.90
No. 1 Hard White.	1.70	@	1.80
No. 1 Soft White .	1.50	@	—
Ledger & Writings..	.75	@	.80
Solid Books.....	.45	@	.50
Blanks	.90	@	—
Krafts	.45	@	.50
New Kraft Cuts.....	1.10	@	—
Manila Env. Cuts...	Nominal		
Ex. No. 1 Manila...	Nominal		
Print Manila	Nominal		
Overissue News.....	.35	@	—
Old Newspapers—			
No. 1 Folded News	.25	@	.30
No. 1 Mixed Paper	.15	@	.20
Roofing Stocks—			
No. 1.....	1.00	@	1.05
No. 2.....	.85	@	—

TORONTO

Paper

Bonds

Direct mill shipment in two-ton lots

No. 1 White $35.50		@	—
No. 1 Tints	36.50	@	—
No. 2 White	25.50	@	—
No. 2 Tints	26.50	@	—
No. 2 Golden Rod..	27.50	@	—
No. 3 White	21.00	@	—
No. 4 White	15.00	@	—
No. 4 Tints	16.00	@	—
No. 4 Golden Rod...	17.00	@	—
Direct mill shipment in three-ton lots			
No. 5 White $10.50		@	—
No. 5 Tints	11.50	@	—
No. 5 Golden Rod..	12.00	@	—
No. 6 White	9.00	@	—
No. 6 Tints	9.50	@	—
No. 6 Golden Rod..	11.00	@	—
No. 7 White	8.00	@	—
No. 7 Tints	8.50	@	—
No. 7 Golden Rod..	10.00	@	—
Book—			
No. 1 M. F.	$7.00	@	—
No. 2 M. F.	6.50	@	—
No. 3 M. F.	5.35	@	—
No. 1 S. C.	7.25	@	—
No. 2 S. C.	6.75	@	—
No. 3 S. C.	5.85	@	—

Coated Book & Litho

Ton Lots (resale)

No. 1 .....$12.00		@	—
No. 2	10.25	@	—
No. 3	8.90	@	—
Coated tinted	13.00	@	—
Wrapping—delivered—			
Rag Brown.....	4.85	@	5.25
White Wrap.....	4.00	@	—
"B" Manila.....	4.90	@	6.15
No. 1 Manila.....	5.50	@	6.90
Fiber	5.50	@	6.90
Kraft No. 2.....	5.50	@	6.90

(F. o. b. Cars, Toronto)

News per ton—			
Rolls (contract)..)46.00		@	—
Sheets	54.00	@	—

Pulp

Ground wood.....$29.00		@	—
Unbleached sulphite.	44.00	@	—
Bleached sulphite...	54.00	@	—
Kraft	50.00	@	—
Soda	54.00	@	—

Old Waste Paper

(In carload lots, f. o. b. Toronto)

Shavings—			
White Env. Cut...	2.00	@	—
Soft White.....	1.75	@	—
White Blk. News..	1.25	@	1.10
Book and Ledger—			
Flat Magazine and Book Stock (old)	.70	@	—
Light and Crumpled Book Stock.	.60	@	—
Ledgers and Writings	1.00	@	—
Manilas—			
New Manila Cut...	1.35	@	—
Printed Manilas...	.45	@	—
Kraft	.95	@	—
News and Scrap—			
Strictly Overissue..	.50	@	—
Strictly Folded....	.45	@	—
No. 1 Mixed Paper..	.30	@	—

Domestic Rags

(Price to Mills, f.o.b. Toronto)

No. 1 White Shirt Cuttings	.07	@	.07¼
Light Prints.....	.03¼	@	.03½